District Preliminary Geotechnical Report, State Route 241/State Route 91 Express Lanes Connector Project, Orange County, California

Prepared for:

Transportation Corridor Agencies

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AASHTO	American Association of State Highway and Transportation Officials
ARS	acceleration response spectra
Caltrans	California Department of Transportation
CDMG	California Division of Mines and Geology - now the California Geological Survey
CH2M	CH2M HILL, Inc.
CIP	Corridor Improvement Project
DPGR	District Preliminary Geotechnical Report
ETC	Eastern Transportation Corridor
h:v	horizontal to vertical
ISA	Initial Site Assessment
K Factor	Soil Erodibility Factor
LOTB	Log of Test Boring
LRFD	load and resistance factor design
mm/year	millimeters per year
Mmax	maximum moment magnitude
MSE	mechanically stabilized earth
OC	Overcrossing
PFR	Preliminary Foundation Report
SR	State Route
USDA	U.S. Department of Agriculture

SECTION 1

Introduction

The Transportation Corridor Agency has retained the Michael Baker International team to provide preliminary engineering services for the Project Approval and Environmental Document phase of the State Route (SR) 241/SR 91 Express Lane Connector Project. The project consists of constructing express lane direct connectors from westbound SR 91 to southbound SR 241 and from northbound SR 241 to eastbound SR 91. A single connector ramp will support these two proposed connector lanes. The project location is shown on Figure 1-1.

The Project Approval and Environmental Document phase of the project includes geotechnical, geologic, and seismic evaluations for the proposed improvements. Results of the CH2M HILL, Inc. (CH2M) preliminary evaluations are summarized in this District Preliminary Geotechnical Report (DPGR).

1.1 Project Description and Existing Facilities

The SR 241/SR 91 Express Lanes Direct Connector is an effort to develop a median-to-median connection between the SR 241 and SR 91 express lanes. The project includes new connectors—one lane in each direction. Connectors will bring vehicles from the median of northbound SR 241 to the existing eastbound SR 91 express lanes. The reverse movement will also be accommodated, from the westbound SR 91 express lanes to the median of southbound SR 241. The eastern terminus of the project is at the Coal Canyon interchange on SR 91. The southern terminus is just north of the Windy Ridge Wildlife Crossing overpass on SR 241.

The proposed connector (in each direction) will yield one 12-foot-wide travel lane and one 10-foot-wide shoulder on the outside of the travel lanes. A parallel lane that tapers back into the existing SR 91 express lanes will be needed to support northbound SR 241 to eastbound SR 91 movement. One 12-foot-wide travel lane is proposed along southbound and northbound SR 241; these lanes will replace the existing 10-foot-wide shoulders. New 10-foot-wide shoulders will then be constructed adjacent to the new travel lanes along SR 241. In addition, the eastbound Gypsum Canyon on- and off-ramps will be realigned to support the new express lane direct connector. The project layout is shown in Appendix A.

Structural improvements proposed with the project include the SR 241 Wildlife Undercrossing Widening, the 241/91 Connector Overcrossing (OC) (North), 241/91 Connector OC (South), and the Eastbound Gypsum Canyon Road Undercrossing Widening. In addition, a retaining wall is proposed to accommodate the widening of northbound SR 241 approximately 0.5 mile south of SR 91, and eastbound SR 91 approximately 0.75 mile east of Gypsum Canyon Road. Mechanically stabilized earth (MSE) walls are planned along the median of SR 91 to support the connector approach.

Roadway improvements are also proposed along the outside eastbound lanes of SR 91. This will include realignment of the Gypsum Canyon interchange to accommodate the widening of the SR 91. The interchange would remain in the same configuration.

An additional lane/shoulder will be added along the alignment from the SR 241/SR 91 interchange east, to the end of the proposed improvements at Station 1526+00 (“EB91” Line). This additional lane will require modification of the existing, roughly 140-foot tall, 1.5:1 horizontal to vertical (h:v) cutslope present in the vicinity of Station 1488+00, along the south side of SR 91. Based on the current plans, the existing toe of this slope will need to be relocated roughly 50 feet to the south. A 2:1 h:v cutslope with terrace drains is proposed to accommodate the widening in this area. This new slope will have a maximum height on the order of 140 feet, similar to the height of the existing cutslope.

Maximum fill thickness will be approximately 50 feet in the vicinity of Station 515+50 ("241DC5" Line). The project plans showing the proposed improvements are presented in Appendix A.

The project area is currently occupied by improvements related to SR 241 and SR 91. These improvements include the state route mainlines, express lanes, overhead and at-grade connectors, embankment fills, bridges and other associated improvements such as utilities and drainage structures. There are manufactured slopes along most of SR 241 and locally along SR 91. Manufactured fill slopes are generally inclined at 2:1 h:v; cutslopes vary, inclined between 1.5:1 and 3:1 h:v.

1.2 Objective and Scope

The objective of this DPGR is to provide sufficient documentation of the geotechnical, geologic, and seismic conditions to support the project team's evaluation of the project. To meet this objective, the scope of work for this DPGR includes the following:

- Collect and review available information including geotechnical, geologic, and seismic data.
- Conduct field reconnaissance to observe the existing site conditions.
- Evaluate the collected data to characterize the subsurface conditions and identify potential geologic hazards along the alternatives.
- Prepare this DPGR to present findings and preliminary geotechnical recommendations for the next phase of the project.

The recommendations presented in this report are based on existing data collected in the area of, and adjacent to, the project site as discussed in Sections 3 and 4. A project-specific geotechnical investigation was not conducted at the time this report was prepared.

Pertinent Reports and Investigations

Previous investigations relevant to the project were reviewed to characterize subsurface conditions for the study area. Previous field exploration, as well as other pertinent documents reviewed during this study, are summarized below.

2.1 Pertinent Reports

A review was conducted of readily available reports and publications from various public and private files addressing the surface and subsurface conditions in the study area. Geologic and geotechnical information were compiled by acquiring reports and publications from the agencies including, Caltrans, the U.S. Geological Survey, and the California Geological Survey (formerly the California Division of Mines and Geology [CDMG])

The general geologic and fault conditions for the study area were evaluated using the *Geologic Map of the Santa Ana 30' X 60' Quadrangle, California* (Morton, 2004). This map was used as the base for the projects Geologic Map (Figure 4-1).

Pertinent documents were collected and reviewed in preparation of this report, including the following:

- California Department of Transportation (Caltrans). 1973. *As-Built LOTB, Gypsum Canyon Road Undercrossing, Bridge No. 55-506R/L, Orange County*. April 11.
- California Department of Transportation (Caltrans). *As-Built LOTB, Gypsum Canyon Road Undercrossing (Widen), Bridge No. 55-506R/L, Orange County*. March 6.
- Transportation Corridor Agencies. (TCA). 1999. *As-built LOTB, Windy Ridge Wildlife Undercrossing, Bridge No. 55-724 R/L, Orange County*. February 4.
- Transportation Corridor Agencies. (TCA). 2010. *As-built LOTB, Windy Ridge Wildlife Undercrossing (Widen), Bridge No. 55-724 R, Orange County*. March 29.
- Transportation Corridor Agencies. (TCA). 1995. *As-built LOTB, WS Connector Overcrossing, Bridge No. 55-794F, Orange County*. June 1.
- Transportation Corridor Agencies. (TCA). 1996. *As-built LOTB, N241/E91 Connector OC, Bridge No. 55-791G, Orange County*. January 9.
- URS Corporation (URS). 2014. *Final Geotechnical Design Report, SR 91 Corridor Improvement Project (CIP), Design Build Project – Package A. Orange County, California*. 12-OR-91-PM R17.34 to R18.91, EA 0F5404. May 9.
- Silverado Constructors (Silverado). 1999a. *Final Geotechnical Certification Report, Design Sections 11, 12 South and a Portion of 12 North from Stations 650+00 to 821+00, Eastern Transportation Corridor, Orange County, California*. January 15.
- Silverado Constructors (Silverado). 1999b. *Revised Final Geotechnical Certification Report, Design Section 12 North (Stations 851+00 to 880+00) and Design Section 13, Eastern Transportation Corridor, Orange County, California*. October 15.

Preliminary Foundation Reports (PFR) have been prepared for the structural improvements proposed in the project, including the: Windy Ridge Wildlife Undercrossing widening, new 241/91 Connector OC (North), new 241/91 Connector OC (South), and Gypsum Canyon Road Undercrossing widening (CH2M, 2015a, 2015b, 2015c, and 2015d). A Preliminary Materials Report for preliminary pavement design has also been prepared for the project (CH2M, 2015e).

2.2 Previous Investigations

Previous explorations along the alignment include those associated with preliminary investigations conducted for the initial SR 241 (Eastern Transportation Corridor [ETC] Section 13) construction. The geotechnical explorations conducted for the ETC Section 13 design were conducted prior to construction, (i.e. before approximately 5.2 million cubic yards of cut were made and 2.5 million cubic yards of fill were placed). The subsurface conditions along the alignment discussed in Section 4 are based primarily on ETC Logs of Test Borings (LOTBs) and as-built geotechnical maps (Appendixes B and C respectively).

The eastern portion of the project along SR 91 overlaps with the SR 91 Corridor Improvement Project (CIP), which is a design-build project currently under construction (Caltrans EA 0F5404). The Geotechnical Design Report for the SR 91 CIP Package A (URS, 2014) was reviewed in preparation of this report.

SECTION 3

Physical Setting

This section provides a brief description of the physical setting of the study area. The subsections cover general climate, topography and drainage considerations, prior land use, and human-made and natural features of engineering and construction significance. These conditions will influence the design, construction, and operation of the project.

3.1 Climate

Based on data collected from the Western Regional Climate Center (2014) for the period of 1912 to 2013 at the Yorba Linda weather station (approximately 6 miles to the west-northwest of the SR 241/ SR 91 interchange), the average annual precipitation is about 14.4 inches per year. Winter storms account for roughly 75 percent of the rainfall in the area, with spring and fall storms accounting for most of the rest. Average monthly temperatures range from an average low of 42 degrees Fahrenheit (°F) in January to an average high of 88°F in August. Daily temperatures can reach over 100°F during summer. Snowfall is very rare, and freeze-thaw conditions are not a concern in this area.

3.2 Topography and Drainage

Topography along the alignment is highly variable, ranging from relatively flat areas along the alignment mainlines and within Santa Ana Canyon, to steeply inclined natural slopes adjacent locally to the mainlines. Manufactured slopes are present essentially along the entire SR 241 portion of the alignment. Manufactured fill slopes are generally inclined at 2:1 h:v; manufactured cutslopes vary, inclined between 1.5:1 and 3:1 h:v. Elevations along the mainlines vary from 1,150 feet at the Windy Ridge wildlife crossing, to 420 feet at Gypsum Canyon Road, and 490 feet at Coal Canyon Road. The topography along the alignment is shown on the project plans in Appendix A.

Drainage along the project alignment consists of sheet flow toward engineered drainage units. No permanent standing surface water was observed within the project limits during the site visit. Temporary surface water may be encountered within surface swales, v-ditches, curbs, and gutters during rainfall events.

3.3 Prior Land Use

See the Phase I Initial Site Assessment prepared for the project (RBF, 2015).

3.4 Human-made and Natural Features of Engineering and Construction Significance

The Santa Ana River is located immediately north of the SR 91 portion of the alignment as seen on Figure 1-1. The Santa Ana River originates in the San Bernardino Mountains and drains to the Pacific Ocean near Newport Beach in Orange County. Prado Dam is an earthen dam that controls flow to the Santa Ana River, and is located approximately 3 miles east of the alignment.

A 1.5:1 h:v cutslope on the order of 140 feet tall is present south of eastbound SR 91 in the vicinity of Stations 1479 to 1494 ("EB91" Line). This slope was constructed in association with the initial SR 241 construction in the mid 1990's. The slope is performing well from a global stability standpoint, however the slope has undergone significant erosion since being constructed. This slope will be regraded to support the proposed design along SR 91.

Numerous subdrains have been constructed within the SR 241 limits (see Section 4.2 and Appendix C), with a number of the subdrains located in areas of the proposed structures.

Geologic Setting

The data sources discussed in Section 2 were used to describe the general geologic setting in the study area, including regional geology, faulting, and seismicity. This section also identifies potential seismic hazards within the study area. These potential seismic hazards could result in loading conditions that would affect the design and operations of the project.

4.1 Geology

The project is located within the Peninsular Ranges geomorphic province of California, characterized by a series of northwest-trending mountains, valleys, and faults, all of which generally parallel the San Andreas Fault system. The Santa Ana Mountains and the Whittier Fault are prime examples of this northwest-trending regional structure. The Santa Ana Mountains are present as a result of uplift related to movement of the San Andreas and its associated faults, such as the Whittier Fault. As shown on the Caltrans Acceleration Response Spectra (ARS) online generated map in Appendix D, the Whittier segment of the Elsinore Fault Zone is the closest active fault to the site, mapped on the north side of Santa Ana Canyon, north of the study area. The Glen Ivy and Chino segments of the Elsinore Fault Zone are also in close proximity to the site as shown in Appendix D. The site is within the northwestern flank of the Santa Ana Mountains. The Santa Ana Mountains are a structural block bounded by the coast on the west and the Whittier-Elsinore fault zone on the east. The western portion of the Santa Ana Mountains block is underlain predominately by alluvial deposits and Tertiary-aged sedimentary rocks.

4.2 Subsurface Conditions

Locally, the study area is underlain by: artificial fill placed in association with SR 241 and SR 91, sediments eroded from upland areas and transported and deposited by the Santa Ana River, competent landslide debris (left in place during construction of SR 241), and sedimentary bedrock of the Topanga, Vaqueros/Sespe, and Santiago Formations. Summary descriptions of the geologic units expected within the study area are presented below. The distribution of earth units is shown on the geologic map covering the site (see Figure 4-1). The geology mapped during grading of the subject portion of the ETC is presented in Appendix C.

The following units may be encountered along the alignment:

- **Surficial soils (Alluvial and artificial fill soils):** The artificial fill soils in the upper 5 feet along SR 91 CIP Package A (URS, 2014a) were described as clayey sand and silty sand, both of which contain variable amounts of gravel. The alluvial soil underlying the fills were generally described as unconsolidated interbedded gravels, sands, silts, and clays (Silverado, 1997).
- **Competent Landslide Debris:** During construction of SR 241 (ETC) Sections 12 and 13, numerous landslides were encountered during grading. The landslides were either completely removed or stabilized. The landslide debris left in-place will be similar to the landslides' bedrock units. The bedrock units along the alignment are described below.
- **Topanga Formation:** The Topanga Formation along the alignment consists of marine, yellow-brown, light olive-gray to dark gray massively interbedded, fine- to medium-grained sandstone and siltstone, with minor, sandy, cobble conglomerate beds. Bedding within the unit is generally poorly defined, with cross-bedded sandstone beds present locally (Silverado, 1997). This unit is present along portions of SR 241 within the project area.

- **Vaqueros/Sespe Formation, undifferentiated:** The undifferentiated Vaqueros/Sespe Formation generally consists of interfingering beds of nonmarine and marine, red-brown, green, and gray clayey and silty, fine- to coarse-grained sandstone interbedded with dark, reddish-brown, sandy siltstone and mudstone. The formation is predominantly poorly bedded to massive, with crossbedded sandstone beds present locally. The Vaqueros/Sespe Formation is moderately to well-indurated with some cemented zones (Silverado, 1997). This unit is present along portions of SR 241 within the project area.
- **Santiago Formation:** The Santiago Formation generally consists of light yellow-brown sandstone with some interbedded lenticular siltstone (Silverado, 1997). In general, the unit is thickly to massively bedded. The formation is generally moderately to well-indurated with some cemented zones. The proposed lane additions to eastbound SR 91, roughly 0.5 mile east of Gypsum Canyon Road, will encroach on an existing 1.5:1 h:v cutslope cut into the Santiago Formation.

The following summary of subsurface conditions is based on our site visit and our review of available, existing geotechnical data for ETC Sections 12 North and 13 and the SR 241/SR 91 interchange (Silverado, 1999a, 1999b).

The vicinity of the Windy Ridge Wildlife Undercrossing is underlain by compacted fill over landslide debris and bedrock of the Vaqueros/Sespe and Santiago Formations. The depth of fill below the southbound SR 241 lanes at the wildlife crossing ranges from approximately 50 to 130 feet in thickness. A subdrain has been constructed at the base of this compacted fill, which transects the wildlife crossing from southwest to northeast. At the area of the proposed widening, the subdrain is located up to 130 feet below existing grade.

The SR 241 mainlines, from the wildlife crossing north, to the proposed SR 241/SR 91 Connector OC (South) – Station 515+50 ("241DC5" Line), are underlain by compacted fill over terrace deposits, landslide debris, and bedrock of the Vaqueros/Sespe and Santiago Formations. The depth of fill along this stretch of highway varies from 4 feet in overexcavated cut areas to approximately 150 feet locally in former canyon areas. Numerous subdrains were constructed at the base of the compacted fill in numerous areas along this stretch of the highway.

The area of the proposed 241/91 Connector OC (South) – Stations 515+50 to 521+50 ("241DC5" Line), is mapped as being underlain by compacted fill over alluvial soil, terrace deposits, landslide debris, and bedrock of the Topanga and Vaqueros/Sespe Formations. The depth of fill along this area varies in thickness, up to approximately 115 feet locally in a former canyon area. Two subdrains have been constructed in this area, with one subdrain located at the base of the compacted fill in the canyon fill near the vicinity of Station 515+80. An additional subdrain has been constructed in the vicinity of Station 520+00.

Northeast of the 241/91 Connector OC (South) – Station 521+50 ("241DC5" Line) to Station 528+50, the alignment is mapped as being underlain by compacted fill over bedrock of the Vaqueros/Sespe Formations. The south abutment area of the 241/91 Connector OC (North), (south of Santa Ana Canyon Road, south of Station 531+80) to Station 528+50 is mapped as Topanga Formation bedrock. A subdrain has been constructed in the vicinity of Station 524+00 at the base of the compacted fill, which is on the order of 60 feet in thickness.

A 1.5:1 h:v cutslope is present extending up from Santa Ana Canyon Road at Station 531+80 ("241DC5" Line), this cutslope is mapped as being composed of Topanga Formation and undifferentiated Vaqueros/Sespe Formation bedrock. Based on the current design, the roadway will sit on cut within bedrock from Stations 528+50 to 531+00.The southwestern abutment for the proposed 241/91 Connector OC (North) will be situated in this area. The proposed 241/91 Connector OC (North) will extend northeast from this abutment and connect to SR 91 near Station 547+50. The bridge from the cutslope to the northeast will be underlain by fill related to SR 91 and the SR 241/SR 91 interchange, overlying alluvial soils in Santa Ana Canyon.

From Station 547+50 (“241DC5” Line) east along SR 91, the proposed connector and subsequent transition to the mainline toll lanes of SR 91 will be underlain by fill related to SR 91, overlying alluvial soils in Santa Ana Canyon.

The proposed eastbound Gypsum Canyon Road undercrossing widening will be underlain by fill related to SR 91, overlying alluvial soils in Santa Ana Canyon.

The proposed improvements require modification of the existing roughly 140-foot tall, 1.5:1 h:v cutslope present in the vicinity of Station 1488+00 (“EB91” Line), along the south side of SR 91. This slope is composed of Terrace Deposits above Santiago Formation bedrock. Bedding planes within the Terrace Deposits are expected to be limited and subhorizontally dipping. Beds within the Santiago Formation exposed on this slope are variable, but generally trend north 10 degrees west to north 30 degrees west and dip 30 to 60 degrees to the west-southwest. These bedding planes, when intersected with the existing slope face, exhibit an out-of-slope bedding component on the order of 9 degrees.

4.3 Faulting and Seismicity

The study area is not located within an Earthquake Fault Zone, as delineated by the Alquist-Priolo Earthquake Fault Zoning Act of 1972 (CDMG, 2000a). Numerous inactive faults have been mapped in the project area in regional studies and during construction of SR 241 and the SR 241/SR 91 Interchange (Morton, 2004; Silverado, 1999a, 1999b); however, no active faults have been mapped transecting the project area.

The study area is located within a seismically active area in Southern California. The Caltrans ARS Online Tool (Caltrans, 2015) indicates that several active faults are present in the region, as shown in Appendix D, and as listed in Table 4-1. The closest active fault relative to the alignment is the Whittier segment of the Elsinore Fault Zone.

SECTION 5

Geotechnical Conditions

Geotechnical conditions were identified based on the review of past geotechnical information referenced in Section 2. These geotechnical conditions include groundwater, erosion potential, seismic hazards, slope stability, excavation characteristics, and potential geologic hazards.

5.1 Groundwater

No surface bodies of water are present within the proposed alignment. The active channel of the Santa Ana River is situated between 250 and 2,000 feet north of the SR 91 centerline. Flow within the Santa Ana River is controlled by Prado Dam, situated roughly 3 miles northeast of the eastern end of the project.

Groundwater levels in the Santa Ana Canyon generally correspond to the elevation of the Santa Ana River bed, which corresponds to a depth greater than 25 feet below the existing SR 91 lanes. Along SR 241, sedimentary bedrock formations and artificial fill are present. The bedrock units are generally considered non-water bearing. However, local seepages do exist with the formation, along fracture/fault zones; and local perched water bodies may be present where permeability contrasts exist within the unit. Seepages, as well as groundwater at the base of the existing fills, are controlled by subdrain systems installed during the original construction of SR 241 (Silverado, 1999a).

According to the *Seismic Hazard Zone Report for the Prado Dam and Black Star Canyon 7.5-Minute Quadrangles* (California Division of Mines and Geology, 2000b, 2000c), historically high groundwater level within the Santa Ana Canyon ranges from less than 10 feet to 40 feet below the ground surface. Historically high groundwater levels are not available for the mountainous portions of the project.

Fluctuations in the groundwater level and soil moisture content variations should be anticipated during and after the rainy season. Irrigation of landscaped areas, nearby construction, and numerous other human-made and natural influences could also cause a fluctuation in local groundwater levels.

5.2 Erosion

Erosion occurs when rock and/or soil surfaces are exposed to weathering caused by wind and/or water. The United States Department of Agriculture (USDA) (2015) has delineated Soil Erodibility Factors (K Factors), for the soil units mapped along the alignment. The K Factor provides an indication of how susceptible surface soils are to erosion. The USDA ratings for the soils along the alignment are shown in Appendix E.

In general, a K Factor of 0.05 to 0.20 is considered to have a low susceptibility to erosion; 0.20 to 0.40 is considered moderate and greater than 0.40, high (USDA, 2013). Soils mapped along the alignment have a K Factor ranging from 0.05 to 0.37. Based on the distribution of mapped soil units along the alignment, the project area is considered to have a moderate erosion potential.

5.3 Seismic Hazards

Two types of seismic hazards were considered within the study area. The first involved primary hazards from ground rupture and shaking. The second involved secondary hazards, primarily generated by ground shaking.

5.3.1 Primary Seismic Hazards

The primary seismic hazards present within the study area include seismic shaking and fault-induced ground rupture.

5.3.1.1 Seismic Shaking

Each of the PFRs (CH2M, 2015a, 2015b, 2015c, 2015d) prepared for the proposed structures contains structure specific seismic recommendations. The following information is for the intersection of SR 241 and SR 91 as shown in Appendix D. Based on the various soil types anticipated within the study area, an average shearwave velocity of 900 feet per second (270 meters per second) was selected for this conceptual level of study. Based on the Caltrans (2015) ARS Online Tool, response spectral analysis was conducted to estimate the ground motions at the site. Results indicate a peak ground acceleration of 0.63 (g = acceleration due to gravity). The average shearwave velocity to be used in the final design will be based on future site-specific data. Seismic data are presented in Appendix D; controlling faults are summarized in Table 4-1.

5.3.1.2 Fault-Induced Ground Rupture

Fault-induced ground rupture could occur where active or potentially active faults cross the project alternatives. At these locations, a potential exists for permanent ground displacement along the fault during an earthquake. The nature of the rupture could be vertical movement, horizontal movement, or some combination of vertical and horizontal movement. There are no known active or potentially active faults that transect the study area (see Section 4.3), the risk of ground rupture along the alignment is considered to be low.

5.3.2 Secondary Seismic Hazards

A number of geologic hazards can result from strong ground shaking caused by a seismic event. These hazards range from liquefaction to seismically induced settlements, and are discussed below.

- **Liquefaction:** During strong ground-shaking, loose, saturated, cohesionless soils in the upper 50 to 75 feet below ground surface can experience a temporary loss of shear strength and ground deformations can occur. This phenomenon is known as liquefaction. The potential for liquefaction will depend on a combination of soil density, the grain-size distribution, depth below the ground surface, and the location of the water table. Consequences of liquefaction could include loss in bearing capacity of foundations, lateral flow or spreading of the ground, and post-earthquake settlement. The elevated portions of the project area underlain by bedrock and artificial fill over bedrock are not considered susceptible to liquefaction. Historic high groundwater levels in the vicinity of the SR 241/SR 91 interchange and within Santa Ana Canyon along SR 91 have been mapped at 10 to 40 feet below ground surface (CDMG, 2000b, 2000c). These areas have been mapped in a liquefaction Zone of Required Investigation as shown on Figure 5-1.
- **Seismically Induced Landslides:** The potential for seismically induced landslides will depend on the steepness of the slope, strength and structure of the soil/rock, groundwater depth and extent, and level of ground shaking. Consequences could include adverse loading on structures located on or adjacent to ground that moves. The steeper portions of the slopes along the subject portions of SR 241 and SR 91 have been mapped in an earthquake-induced landslide Zone of Required Investigation as shown on Figure 5-1. The slopes within the limits of the existing SR 241 improvements have not been included in the Zone of Required Investigation. Landslides/unstable areas were previously located within the SR 241 portion of the project area. However, they have been removed/stabilized during the construction of SR 241. There is one slope along SR 91 which will require significant modification, as discussed in Sections 5.4 and 6.2.

- **Seismically Induced Settlement:** Loose, unsaturated granular soils are susceptible to seismically induced settlement. These settlements can result in total and differential settlement of soils supporting structures, roadways, and utilities. The magnitude of these settlements will depend on the type of structure, the characteristics of the soil below the structure, and the level of ground shaking. In general, soils above the groundwater table may be susceptible to seismically induced settlement, including the sediments within the Santa Ana River channel.
- **Tsunamis and Seiches:** Tsunamis are waves typically generated offshore or within large open bodies of water primarily during subaqueous fault rupture or a subaqueous landslide event. Seiches are waves generated within a large closed body of water, also caused either by subaqueous fault rupture or landslide events, or by ground oscillations from distant earthquakes. The study area is located roughly 20 miles from the Pacific Ocean, and has a minimum elevation over 300 feet. As there are no enclosed bodies of water adjacent to the study area, there is no potential impact to the project due to a tsunami or seiche. However, the SR 91 portion of the alignment is located within the inundation zone associated with a failure of Prado Dam on the City of Anaheim General Plan Dam Inundation Map (City of Anaheim, 2001).

5.4 Slope Stability

The stability of a slope depends on the inclination, geology and geologic structure, soil and rock strength, and ground and surface water conditions within the slope. Areas with slopes have a potential hazard from slope failures. In addition, excavating, grading, or fill work during construction might introduce temporary slope stability hazards.

The existing slopes present along the alignment will not be significantly modified by the proposed improvements, with the exception of the existing 1.5:1 h:v cutslope located in the vicinity of SR 91 Station 1488+00 (“EB91” Line). Considering that this slope was cut at a 1.5:1 h:v inclination and is performing well from a global stability standpoint, it is likely that the majority of the bedding is either neutral to, or into, slope and that the out-of-slope bedding component (see Section 4.2) is negligible and does not lend to the instability of the slope. No clay seams or significant planes of weakness were mapped on the slope (see Appendix C). This slope is currently undergoing considerable erosion, due to the nature of the Santiago Formation, and the steep 1.5:1 h:v inclination of this slope. Erosional rills on the order of 1 to 2 feet in depth and 3 to 4 feet in width were observed on the slope during the site reconnaissance conducted in 2011.

5.5 Excavation Characteristics

It is expected that the onsite bedrock, including the cutslope proposed at Station 1488 (“EB91” Line), will be rippable using conventional methods and equipment. However, localized beds will likely be encountered that will be marginally rippable. These beds will likely be able to be slowly broken down using a concentrated effort, such as with heavy ripping, percussion hammers, or breakers. Oversized material may be generated from these operations, or may be encountered locally within the alluvial soils or conglomerate beds.

5.6 Corrosion Characteristics

Soils are defined as corrosive based on the Caltrans Corrosion Guidelines (Caltrans, 2012).

Soils are considered to be corrosive to structural elements if one or more of the following conditions exist:

- Soluble chloride concentration is greater than or equal to 500 parts per million.
- Soluble sulfate concentration is greater than or equal to 2,000 parts per million.

- The pH is 5.5 or less.

The SR 91 CIP (which includes the eastern portion of the SR 91 segment) Geotechnical Design Report (URS, 2014) indicated that corrosive soils were encountered locally during the investigation. Based on the ETC Section 13 Materials Report (Silverardo, 1997), predominantly noncorrosive materials were encountered during the investigation.

Corrosion testing would be conducted during future phases of the project. During design, a corrosion engineer would review the corrosion data and provide appropriate corrosion design recommendations.

5.7 Ground Settlement and Collapsible Soils

Ground settlement can occur when new loads are added to soil, or when a change in water levels results in a decrease in pore water pressures within compressible soils. Collapsible soils consist predominantly of sand- and silt-size particles arranged in a loose “honeycomb” structure. This loose structure is held together by small amounts of water-softening cementing agents, such as clay or calcium carbonate. When the soil becomes wet, these cementing agents soften and the honeycomb structure collapses and generates ground settlement. Both conditions could potentially occur within the study area, in particular within young alluvial sediments such as those which underlie SR 91 in the project area.

5.8 Expansive Materials

Expansive soils are clay-rich soils that swell and shrink with wetting and drying. The mineralogy and percentage of clay-sized particles present within a soil determine the potential for expansive behavior. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. Bedrock units also can exhibit expansive properties due to the clay content within the bedrock. Clay-rich soils and bedrock are locally present within the study area. Expansive soils are not uncommon, and can be exported offsite or mixed with non-expansive soils to yield a material suitable for its intended purpose.

Most of the proposed improvements will be founded in existing or new engineered fill. The existing fills were placed in accordance with Caltrans guidelines, and expansive fills are not anticipated within 4 feet of finished grade.

Between direct connector Stations 528+50 and 531+00 (“241DC5” Line), the alignment will be situated atop cut in the Topanga and Vaqueros/Sespe formations. During the original construction of SR 241, the Vaqueros/Sespe formation was observed to be locally highly expansive. Future geotechnical investigations should evaluate the expansion potential of the Vaqueros/Sespe formation bedrock exposed at or near subgrade.

5.9 Hazardous Materials

Please see the Initial Site Assessment prepared for the project (RBF, 2015).

SECTION 6

Preliminary Recommendations and Conclusions

The SR 241/SR 91 Express Lanes Connector Project is considered feasible from a geotechnical standpoint. A generalized discussion of the geologic setting and potential geologic hazards covering the study area is presented in Sections 3 through 5 of this report. The following is a discussion of preliminary planning-level recommendations for the project, design-level geotechnical recommendations will be presented in a future Geotechnical Design Report during the next phase of the project. Preliminary geotechnical recommendations for the proposed structures, including the SR 91 median MSE walls, can be found in the associated PFRs (CH2M, 2015a, 2015b, 2015c, 2015d).

A number of the potential geotechnical hazards discussed in Section 5 of this report, including some secondary seismic hazards such as liquefaction will require additional investigation. These hazards are common to California and can be mitigated by implementing the appropriate design measures. Future geotechnical investigations will provide the needed geotechnical parameters to appropriately design the project to account for the appropriate hazards. The project would be designed in accordance with Caltrans Standard Specifications, which include general earthwork and grading specifications.

6.1 Retaining walls

The proposed retaining walls are summarized in Table 6-1 and are shown on the project plans in Appendix A. Retaining walls will be designed in accordance with the LRFD method as specified in the *AASHTO LRFD Bridge Design Specifications* (AASHTO, 2012), and *California Amendments to AASHTO LRFD Bridge Design Specifications* (Caltrans, 2014).

The maximum retaining wall height for the project is on the order of 30 feet. For preliminary planning purposes, Caltrans standard walls and MSE walls appear to be suitable retaining wall types. At the locations where right-of-way is limited soldier pile walls can be considered, dependent on the subgrade materials present. A soil-nail or tieback wall may be required where a retaining wall supports a relatively high cutslope.

6.2 Cutslope South of Eastbound SR 91 (Station 1488+00 “EB91” Line)

The maximum cutslope for the project is in the vicinity of Station 1488+00 (“EB91” Line) where a modification to the existing 1.5:1 h:v cutslope is proposed. The existing slope is performing well from a global stability standpoint. The new slope will have a maximum height of 140 feet, similar to the height of the existing cutslope in this area. Considering that the slope height will not increase, and the slope will be regraded at 2:1 h:v inclination with terrace drains, it is anticipated that the slope will be stable. The geology of this slope should be further evaluated during the next phase of the project to confirm that adverse conditions are not present.

6.3 General Earthwork

Numerous subdrains have been constructed within SR 241 limits (see Section 4.2 and Appendix C), with a number of the subdrains are located in areas of the proposed structures. The locations of these subdrains in relation to proposed improvements should be evaluated as the project proceeds.

Based on the currently available layout of the proposed improvements, cuts and fills are expected to reach design grades. This grading can be achieved using conventional earthwork methods.

The proposed lane additions along SR 241 and SR 91 will be underlain by artificial fill and bedrock. The existing fills were placed in accordance with TCA and Caltrans guidelines, and expansive fills are not anticipated within 4 feet of finished grade along the mainlines. Bedrock encountered near road grade along the proposed connector may need to be removed or remediated if found to be expansive. Areas of existing fill may need to be processed (scarified, moisture conditioned, and recompacted), or overexcavated, dependent on the actual conditions observed.

Bridge embankments will be composed of sedimentary bedrock or new engineered fill, similar to the existing SR 241/SR 91 mainline connectors. The embankments would be constructed in accordance with Caltrans Standard Specifications.

6.4 Future Geotechnical Exploration and Investigations

Additional subsurface investigations will be required as the project proceeds. The purpose of the investigations is to evaluate the subsurface conditions and provide geotechnical information for design and construction of structural foundations and remedial earthwork. The following are recommended explorations for the project:

- **Cutslope south of eastbound SR 91, Station 1488 ("EB91" Line,):** The slope should be investigated to verify that favorable geologic structure exists. Downhole geologic structural data should be collected and evaluated from two locations at the top of the slope, the depth of the borings should extend below the toe of slope.
- **Retaining Walls:** For the retaining wall foundations, subsurface explorations would be conducted in accordance with Section 10.4.2 of the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) *Bridge Design Specifications* (AASHTO, 2012). A minimum of one exploration for each retaining wall is recommended. For retaining walls more than 100 feet in length, exploration points will be spaced every 100 to 200 feet. The depth of exploration will extend at least between one and two times the wall height. For anchored and soil-nailed walls, additional exploration points in the anchorage zone are recommended at a distance of 1.0 to 1.5 times the height of the wall behind the wall, spaced at 100 to 200 feet.
- **Bridge Foundations:** See the PFR (CH2M, 2015a, 2015b, 2015c, 2015d)
- **Roadway Design:** Regularly spaced explorations should be conducted to evaluate the pavement and subsurface soils for pavement design. The depth of exploration should be on the order of 10 feet below grade.

All geotechnical explorations except those performed solely for roadway design should extend through unsuitable strata such as soft, highly compressible soils, peat, highly organic materials, and loose coarse-grained soils to reach competent material of suitable bearing strata.

SECTION 7

Limitations

This DPGR has been prepared for the exclusive use of the Transportation Corridor Agencies and its project partners for specific application to the SR 241/SR 91 Express Lanes Connector Project. The report has been prepared in accordance with generally accepted geological and geotechnical engineering practices. No other warranty, express or implied, is made.

The geotechnical and geological information contained in this report is based on data obtained from review of available sources of information such as geological maps and documents, as-built plans, and previous field investigations within the study area. The logs of soil and rock borings from the available information indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. The borings do not necessarily reflect variations that could exist between locations or possible changes that might take place with time and depth. These variations could change some of the hazards discussed and geotechnical recommendations provided in this report. In addition, information about faulting and seismicity is continually being advanced as new scientific work is carried out. These studies could change the level of hazard from faulting and ground shaking, as well as associated hazards, leading to either reduced or increased hazards. As these discoveries are made, the hazard evaluation for the alternatives may require updating.

In the event that any change in the nature, design, or location of the alternatives occurs, conclusions and recommendations of this report should not be considered valid unless such changes are reviewed, and the conclusions of this report are modified or verified in writing by CH2M's geotechnical staff. CH2M is not responsible for any claims, damages, or liability associated with the reinterpretation or reuse of the subsurface data in this report by others.

References

American Association of State Highway and Transportation Officials (AASHTO). 2012. *AASHTO LRFD Bridge Design Specifications.* 2012. 6th Edition.

California Department of Transportation (Caltrans). 1973. *As-Built LOTB, Gypsum Canyon Road Undercrossing, Bridge No. 55-506R/L, Orange County*. April 11.

California Department of Transportation (Caltrans). 1992. *As-Built LOTB, Gypsum Canyon Road Undercrossing (Widen), Bridge No. 55-506R/L, Orange County*. March 6.

California Department of Transportation (Caltrans). 2012. *Corrosion Guidelines Version 2.0.* Materials Engineering and Testing Services. November.

California Department of Transportation (Caltrans). 2014. *California Amendments to AASHTO LRFD Bridge Design Specifications*.

California Department of Transportation (Caltrans). 2015. *Seismic Design Criteria*. Version 2.3.06. Available at http://dap3.dot.ca.gov/ARS_Online/index.php. Accessed on June 8, 2015.

California Division of Mines and Geology (CDMG). 2000a. *Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region, CD 2000-003*.

California Division of Mines and Geology (CDMG). 2000b. *Seismic Hazard Zone Report 046 for the Black Star Canyon 7.5-Minute Quadrangle*.

California Division of Mines and Geology (CDMG). 2000c. *Seismic Hazard Zone Report 045 for the Prado Dam 7.5-Minute Quadrangle*.

California Division of Mines and Geology (CDMG). 2001a. *Seismic Hazard Zone Map of the Black Star Canyon 7.5-Minute Quadrangle*. Orange County, California, Official Map Released January 17.

California Division of Mines and Geology (CDMG). 2001b. *Seismic Hazard Zone Map of the Prado Dam 7.5-Minute Quadrangle*. Official Map Released January 17.

CH2M HILL, Inc. (CH2M). 2015a. *Preliminary Foundation Report. SR241/SR91 Express Lanes Connector Project, 241-91 Connector OC (North)*. Orange County, California. December.

CH2M HILL, Inc. (CH2M). 2015b. *Preliminary Foundation Report. SR241/SR91 Express Lanes Connector Project, 241-91 Connector OC (South)*. Orange County, California. December.

CH2M HILL, Inc. (CH2M). 2015c. *Preliminary Foundation Report. SR241/SR91 Express Lanes Connector Project, Windy Ridge Wildlife Undercrossing*. Orange County, California. December.

CH2M HILL, Inc. (CH2M). 2015d. *Preliminary Foundation Report. SR241/SR91 Express Lanes Connector Project, Gypsum Canyon Road Undercrossing*. Orange County, California. December.

CH2M HILL, Inc. (CH2M). 2015e. *Preliminary Materials Report. SR241/SR91 Express Lanes Connector Project.* Orange County, California. December.

City of Anaheim, 2001. Seismic and Geologic Hazard Evaluation – General Plan Update. Ninyo and Moore Project No. 203009001. Date September 11.

Michael Baker International. 2015. *Project Plans for Construction on State Highway in Orange County. Caltrans District 12, 12-ORA-241 PM 36.1/36.9 and 12-ORA-91 PM 14.7/18.9.* November.

Morton, D.M. 2004. *Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California*. Southern California Aerial Mapping Project (SCAMP), Open-File Report 99-172, Version 2.0, prepared by the United States Geological Survey (USGS) in Cooperation with the California Geological Survey (CGS).

RBF Consulting (RBF). 2015. *2015 SR-241/SR-91 Express Lanes Connector Project Phase I Site Assessment*. EA 0K9700. June.

Silverado Constructors (Silverado). 1999a. *Final Geotechnical Certification Report, Design Sections 11, 12 South and a Portion of 12 North from Stations 650+00 to 821+00, Eastern Transportation Corridor, Orange County, California*, January 15.

Silverado Constructors (Silverado). 1999b. *Revised Final Geotechnical Certification Report, Design Section 12 North (Stations 851+00 to 880+00) and Design Section 13, Eastern Transportation Corridor, Orange County, California*, dated June 19, 1998. Revised October 15.

Silverado Constructors. 1997. *Revised Final Geotechnical Report, Materials Report for Design Section 13, State Route 241.* Design Submittal Number E13GXXC-03. Prepared for the Transportation Corridor Agencies. October 6.

Transportation Corridor Agencies. 1995. *As-built LOTB, WS Connector Overcrossing, Bridge No. 55-794F, Orange County.* June 1.

Transportation Corridor Agencies. 1996. *As-built LOTB, N241/E91 Connector OC, Bridge No. 55-791G, Orange County.* January 9.

Transportation Corridor Agencies. 1999. *As-built LOTB, Windy Ridge Wildlife Undercrossing, Bridge No. 55-724 R/L, Orange County.* February 4.

Transportation Corridor Agencies. 2010. *As-built LOTB, Windy Ridge Wildlife Undercrossing (Widen), Bridge No. 55-724 R, Orange County.* March 29.

U.S. Department of Agriculture (USDA). 2013. State Office of Michigan. *Revised Universal Soil Loss Equation (RUSLE) Technical Guide.* Available at http://www.iwr.msu.edu/rusle/kfactor.htm.

U.S. Department of Agriculture (USDA), Soil Conservation Service. 2015. *Web Soil Survey 2.0.* Available at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm. Accessed on June 9, 2015.

URS Corporation. (URS). 2014a. *Final Geotechnical Design Report, SR 91 Corridor Improvement Project (CIP), Design Build Project – Package A.* Project Number 08000001361. May 9.

URS Corporation. (URS). 2014b. *Materials Report, SR 91 Corridor Improvement Project (CIP), Design Build Project – Package A.* Project Number 08000001361. June 10.

Western Regional Climate Center. 2014. *Western U.S. Climate Historical Summaries*. Accessed on April 10, 2014, available at http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca9847.

Tables

Table 4-1. Distance to Controlling Faults

SR 241/SR 91 Express Lane Connector Project, Orange County, California

Fault Name/ Fault Identification Number	**Mmax**	**Slip Rate (mm/year)**	**R_{Jup}[a]**	**R_{JB}[b]**	**R_x[c]**
Elsinore Fault Zone (Glen Ivy Section)/365	7.7	5	4.46	4.46	2.40
Elsinore Fault Zone (Whittier Section)/352	6.9	2.5	1.83	1.83	1.83
Elsinore Fault Zone (Chino Section)/355	6.6	1	6.13	0.29	8.01

[a] Closest distance (in kilometers) to the fault rupture plane

[b] Closest distance (in kilometers) measured as the shortest horizontal distance to the surface projection of the rupture area

[c] Horizontal distance (in kilometers) to the fault trace or surface projection

mm/year = millimeters per year

Mmax = maximum moment magnitude

Table 6-1. Proposed Retaining Walls [a]

SR 241/SR 91 Express Lane Connector Project, Orange County, California

Station/Line[b]	Location	Length (feet)	Maximum Height (feet)	Cut/Fill Wall	Supporting Structure
1441 to 1465/"EB91"	SR 91 Median Westbound	1400	15	Fill	Bridge Approach
1441 to 1465/"EB91"	SR 91 Median Eastbound	1400	15	Fill	Bridge Approach
270 to 296/"241DC3"	SR 91 Median	2600	6	Fill	Roadway and Barrier
1504 to 1514/"EB91"	Slope outside SR 91 Eastbound Outside Shoulder	1200	30	Fill	Roadway Widening
882/"B" to 507/"241DC5"	SR 241 Southbound Median	2500	15	Cut/Fill	Roadway Widening

[a] All measurements are approximate

[a] See Appendix A

SR = State Route

Figures

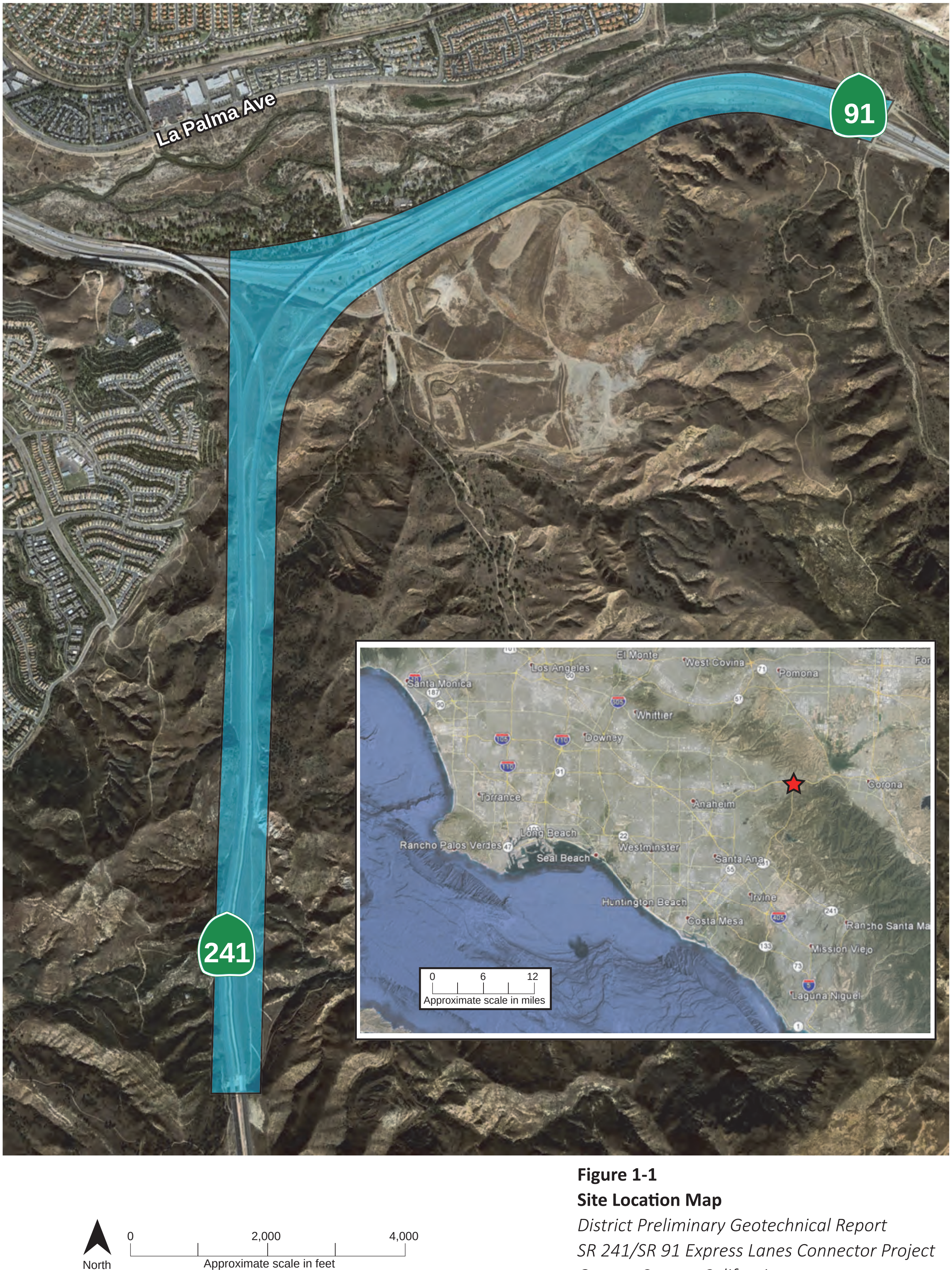
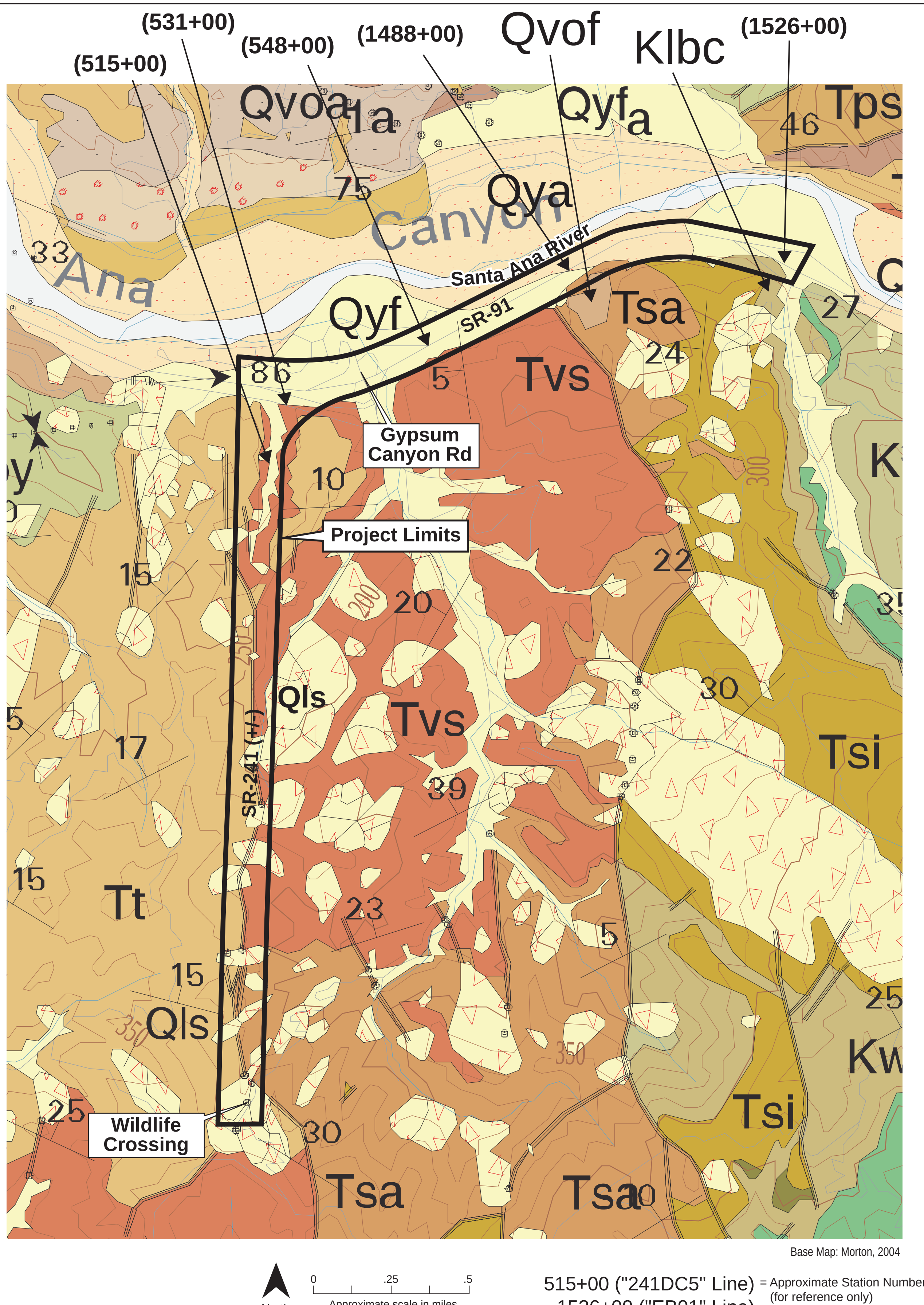


Figure 1-1
Site Location Map
District Preliminary Geotechnical Report
SR 241/SR 91 Express Lanes Connector Project
Orange County, California



EXPLANATION

Contact—Accuracy of location ranges from well-located to approximately located

Fault—Solid where accurately located; dashed where approximately located or inferred; dotted where concealed; queried where location or existence uncertain. Includes strike-slip, normal and reverse dip-slip, oblique-slip, and thrust faults. Arrow and number indicate measured dip of fault plane

Fault scarp—Solid where accurately located; dashed where approximately located. Hachures on upthrown block

Landslide scarp—Solid where accurately located. Hachures on upper part of headscarp

Subsidence scarp—Solid where accurately located. Hachures on upper surface

Anticline—Solid where accurately located; dotted where concealed. Arrowhead on axis shows direction of plunge

Syncline—Solid where accurately located; dotted where concealed. Arrowhead on axis shows direction of plunge

Overturned anticline—Solid where accurately located. Arrowhead on axis shows direction of plunge

Overturned syncline—Solid where accurately located. Arrowhead on axis shows direction of plunge

Suture—Location approximate

Ground fissures—San Jacinto Valley area

Strike and dip of beds

- Inclined
- Vertical
- Overturned
- Horizontal

Strike and dip of metamorphic foliation

- Inclined
- Vertical

Strike and dip of primary igneous foliation

- Inclined
- Vertical

Bearing and plunge of linear features

- Inclined

UNITS

Qyf — **Young alluvial fan deposits (Holocene and late Pleistocene)**—Gravel, sand, and silt, mixtures, some contain boulders; unconsolidated.

Qya — **Young axial channel deposits (Holocene and late Pleistocene)**—Gravel, sand, and silty alluvium; gray, unconsolidated.

Qvof — **Very old alluvial fan deposits (middle to early Pleistocene)**—Sandy alluvium; reddish-brown, well-indurated, fan surfaces well-dissected. (Terrace Deposits)

Qls — **Landslide deposits (late Holocene)**—Active or recently active landslides; unconsolidated to consolidated. Includes many early Holocene landslides that in part have been reactivated during late Holocene

Tt — **Topanga Formation (middle Miocene)**—Marine sandstone, siltstone, and locally conglomerate. Includes:

Tvs — **Vaqueros and Sespe Formations, undifferentiated (early Miocene, Oligocene, and late Eocene)**—Interbedded sandstone and conglomerate; marine and nonmarine

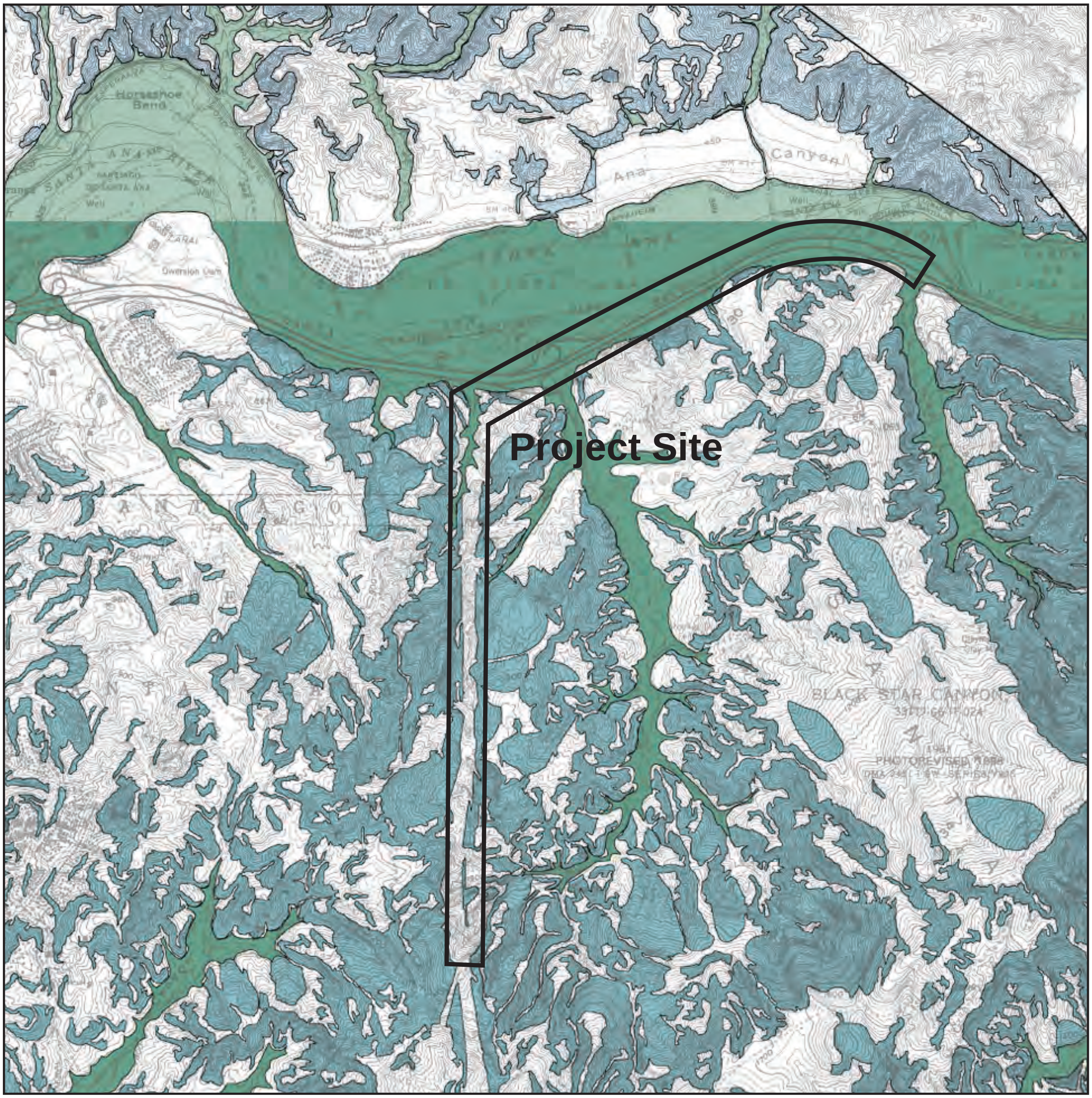
Tsa — **Santiago Formation (middle Eocene)**—Sandstone and conglomerate, marine and nonmarine

Tsis, Tsicg, Tsi — **Silverado Formation (Paleocene)**—Sandstone, siltstone, and conglomerate; nonmarine and marine. Much of unit is thoroughly weathered. Basal conglomerate (Tsicg) and Serrano clay (Tsis) are subdivided locally

Ladd Formation (Late Cretaceous)

Klbc — **Baker Canyon Conglomerate Member**—Conglomerate, conglomeratic sandstone and pebble conglomerate; marine and locally nonmarine(?)

Figure 4-1
Geologic Map
District Preliminary Geotechnical Report
SR 241/SR 91 Express Lanes Connector Project
Orange County, California



Reference: CDMG, 2001a and 2001b

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction – Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground-water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake Induced Landslides – Areas where previous occurrence of landslide movement, or local geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

North

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APPROXIMATE SCALE

Figure 5-1

Seismic Hazard Zones Map

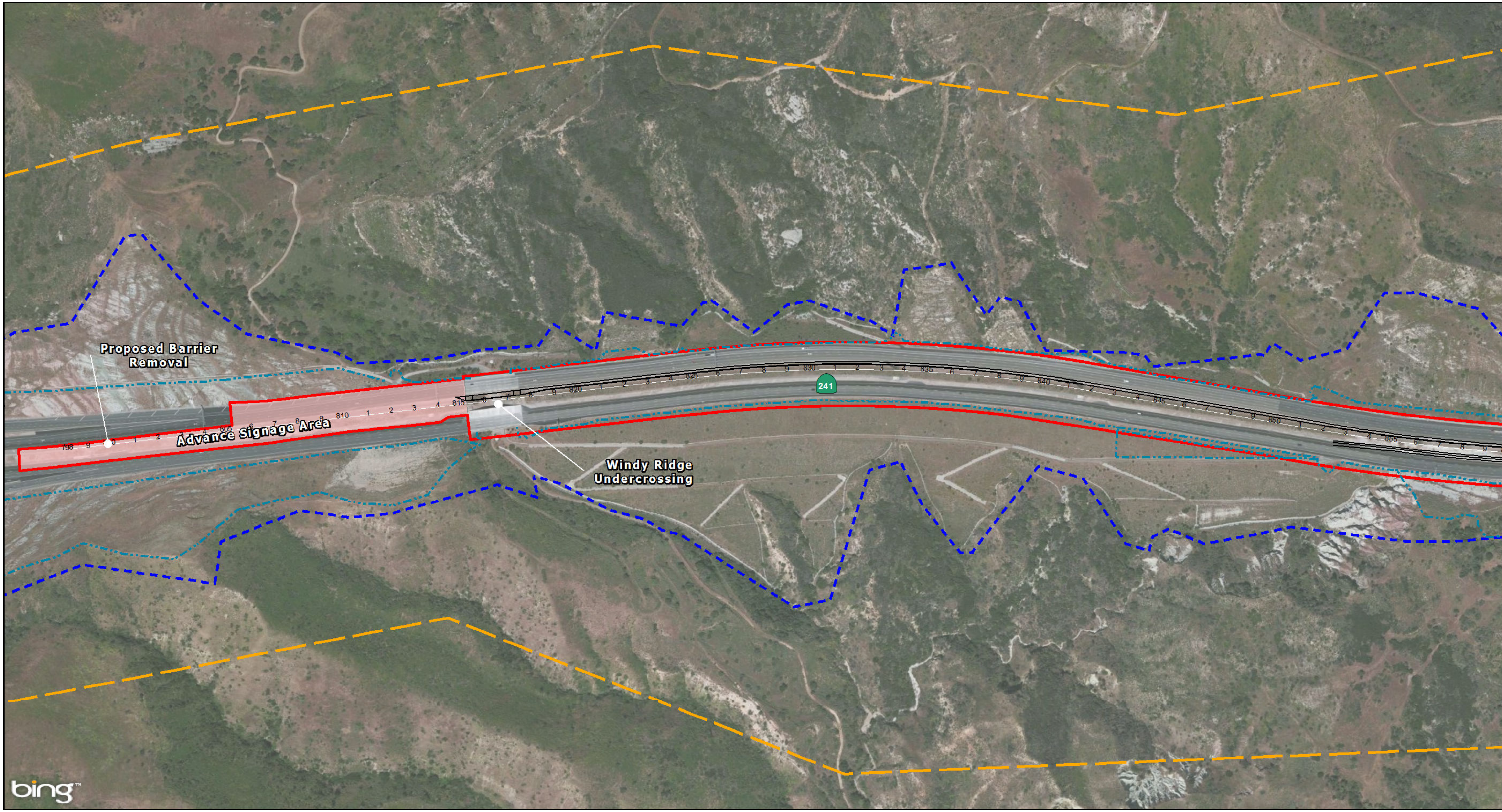
District Preliminary Geotechnical Report

SR 241/SR 91 Express Lanes Connector Project

Orange County, California

Source: CGS Seismic Hazard Zones, Black Star Canyon and Prado Dam Quadrangles (January 17, 2001), Official Maps

Appendix A
Project Layout Maps and Plans



LEGEND

- Project Area (Physical Improvements)
- Advance Signage Areas
- ETC EIR/EIS Project Area
- Existing Caltrans Right-of-Way
- Proposed Right-of-Way
- Existing Wildlife Fencing
- Proposed Roadway
- Proposed Grading Limits (Slope and Access Road)
- Proposed Bridge Structure
- Proposed Retaining Wall
- Station Line
- Proposed Biofiltration Swale
- Proposed Media Filter
- Proposed Storm Drain Pipe
- Proposed Storm Drain Swale
- Proposed Storm Drain Structure

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SOURCE: Bing (2012); RBF (7/1/2015)

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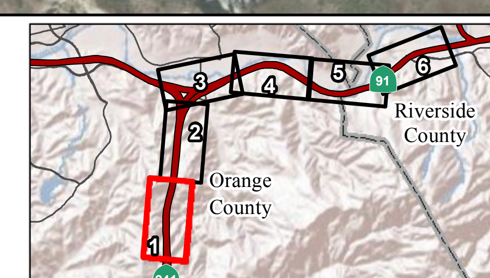
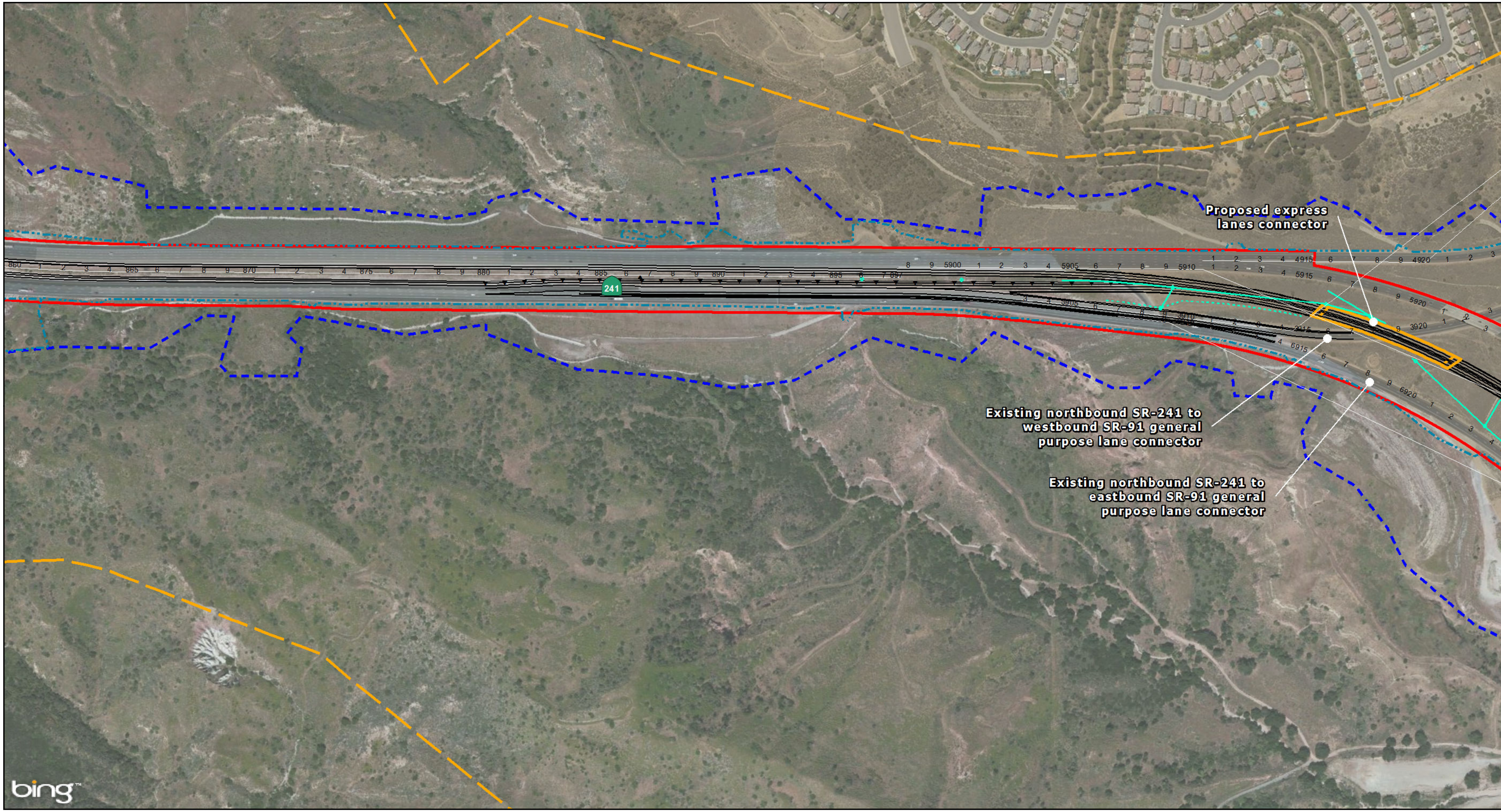


FIGURE 2

Sheet 1 of 6

SR-241/SR-91 Express Lanes Connector

Build Alternative



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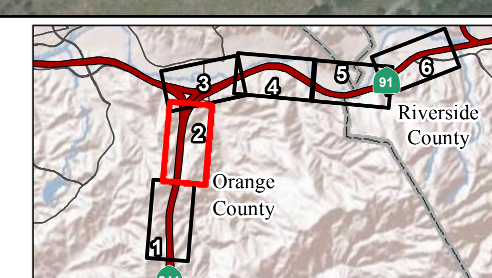
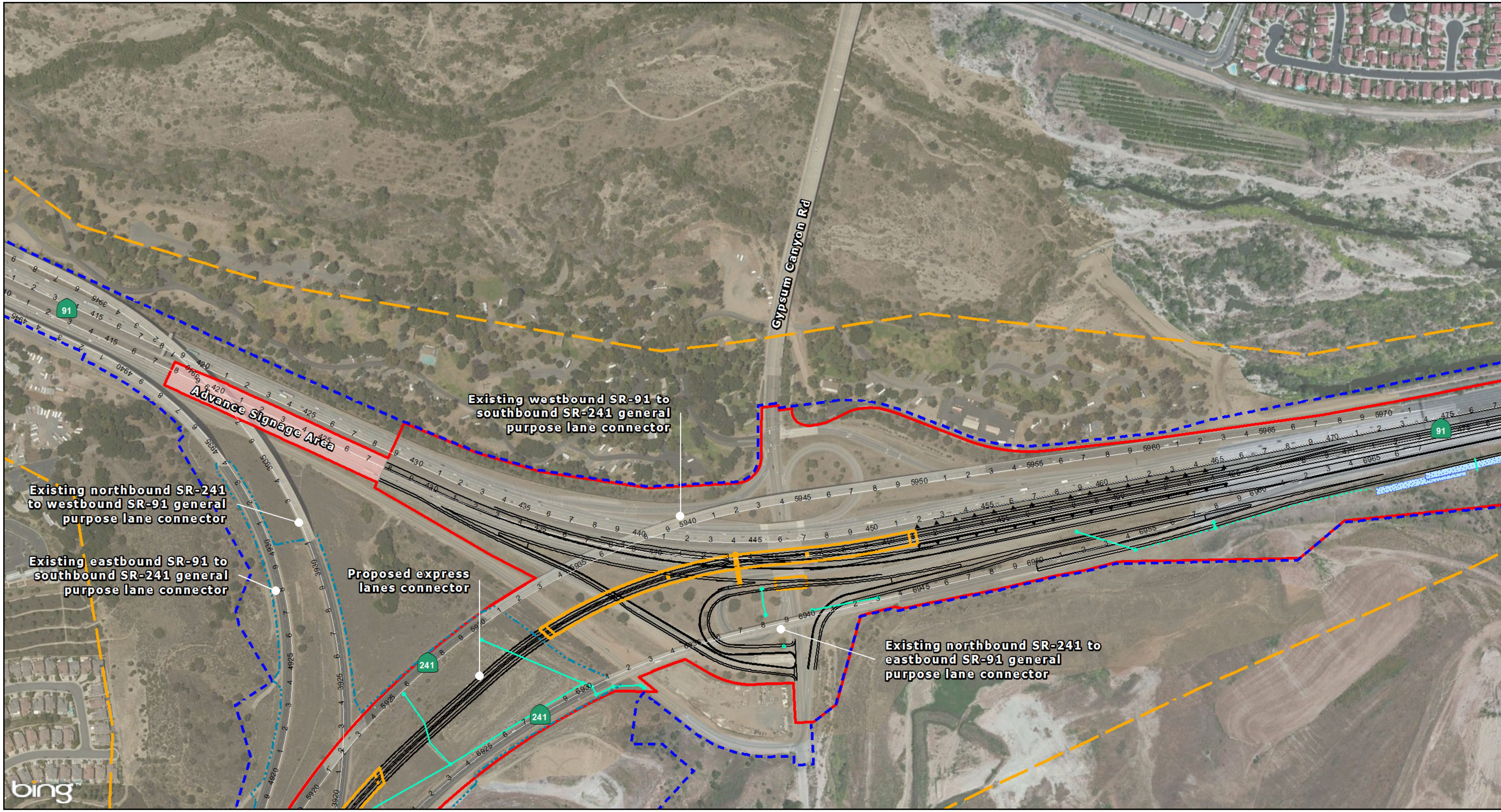


FIGURE 2

Sheet 2 of 6

SR-241/SR-91 Express Lanes Connector

Build Alternative



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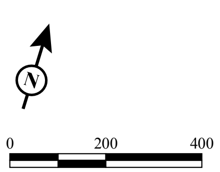

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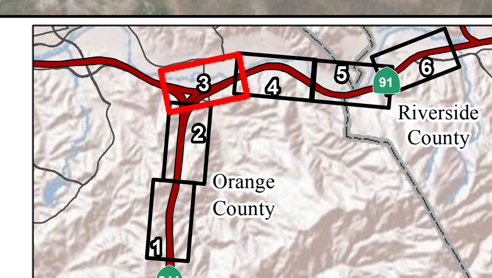
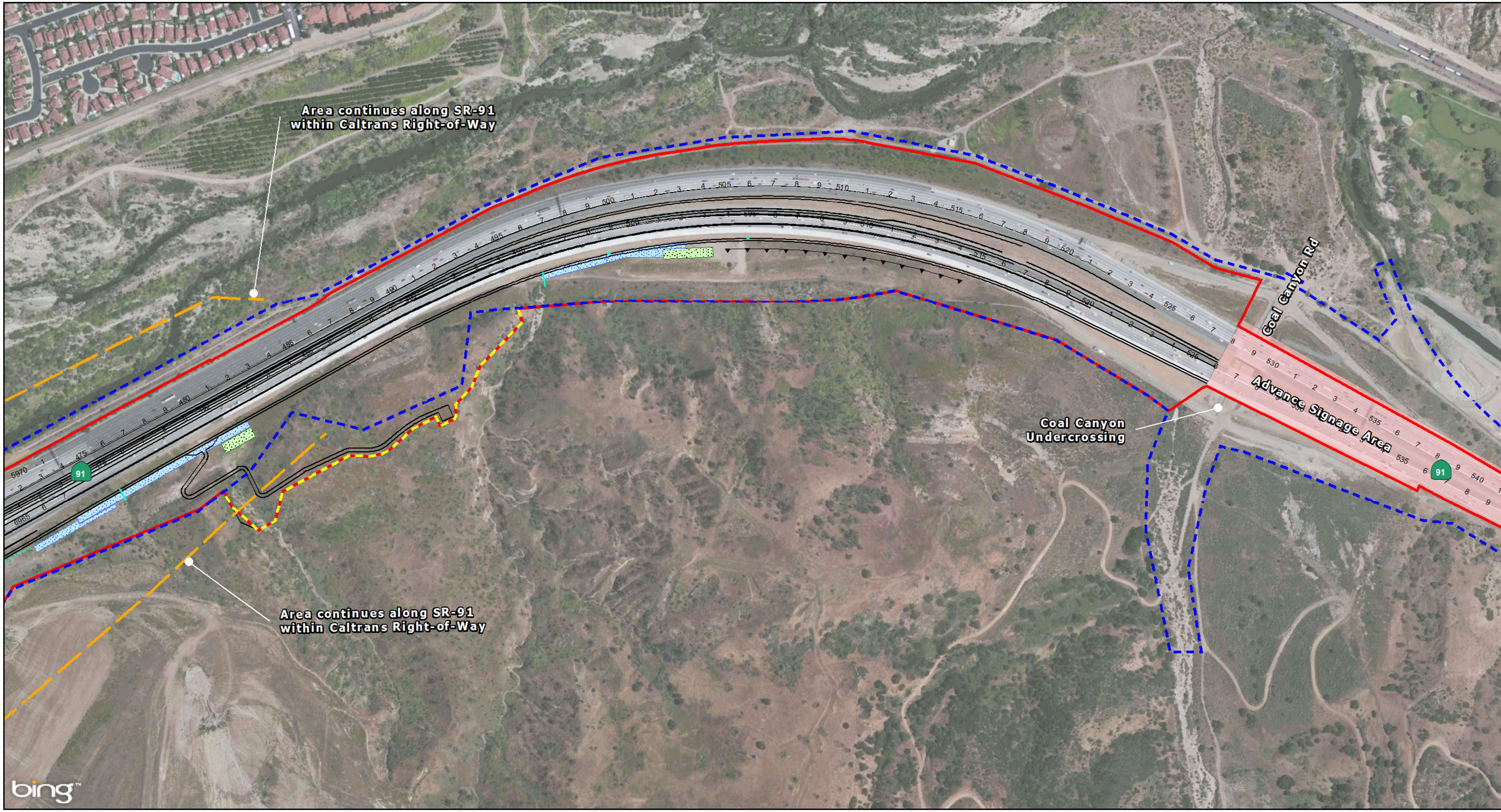


FIGURE 2

Sheet 3 of 6

SR-241/SR-91 Express Lanes Connector

Build Alternative



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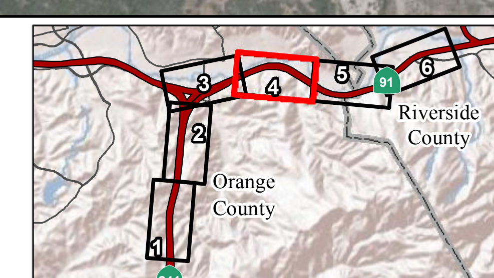

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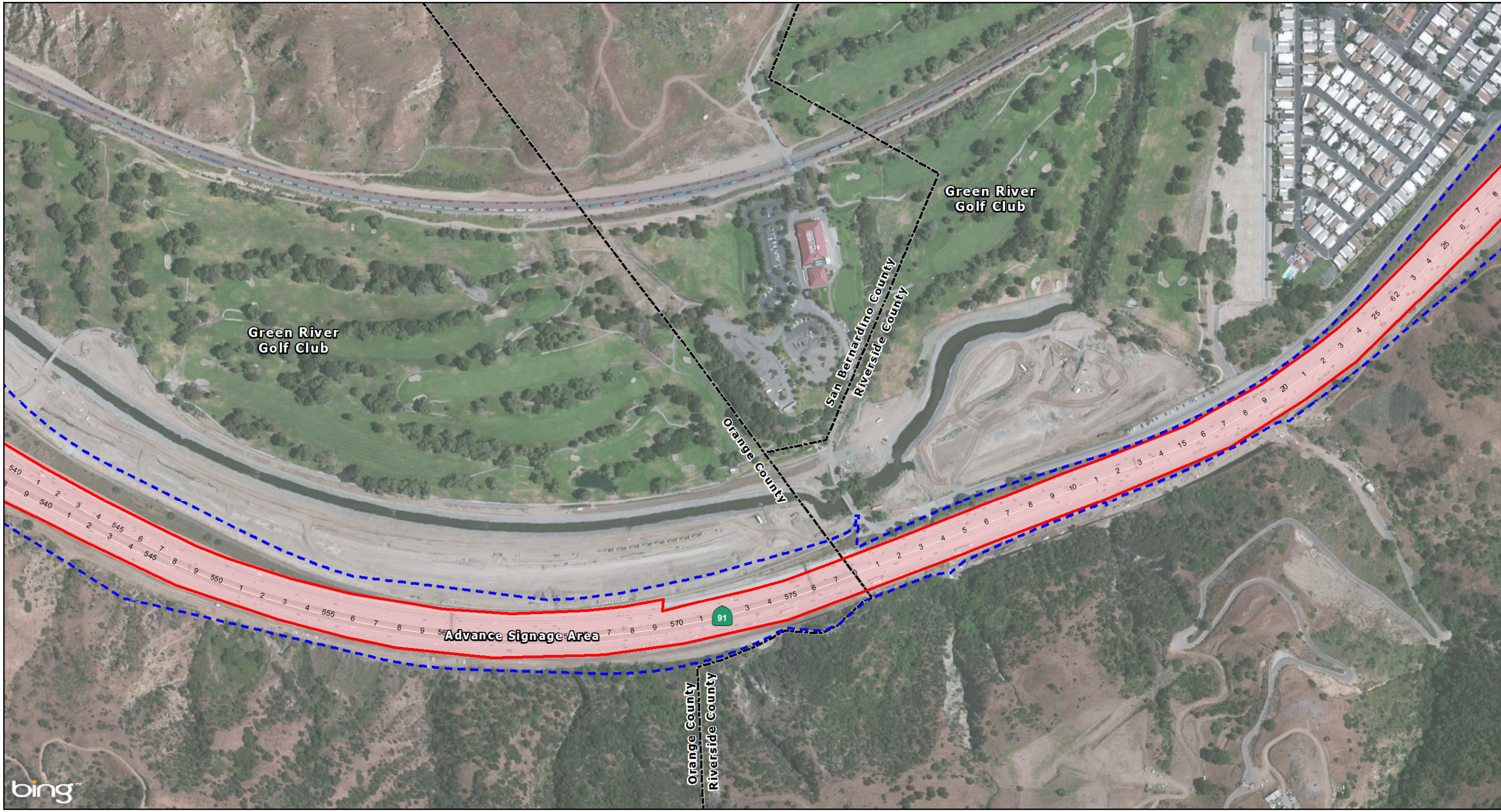
FIGURE 2
Sheet 4 of 6

SR-241/SR-91 Express Lanes Connector

Build Alternative



LEGEND

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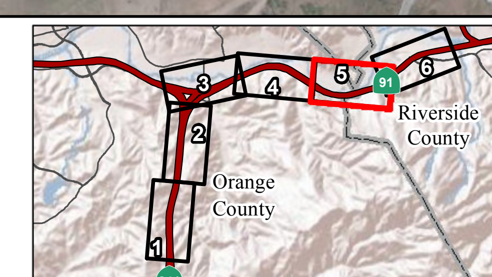

FIGURE 2
Sheet 5 of 6

SR-241/SR-91 Express Lanes Connector

Build Alternative

LEGEND

- Project Area (Physical Improvements)
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FEET

SOURCE: Bing (2012); RBF (7/1/2015)

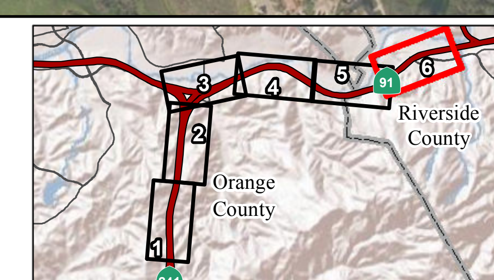


FIGURE 2
Sheet 6 of 6

SR-241/SR-91 Express Lanes Connector

Build Alternative

I:\RBF1101\GIS\BuildAlternative.mxd (2/3/2016)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	14.7/18.9, 36.1/39.1, 0.0/1.5		

REGISTERED CIVIL ENGINEER   X/X/XX DATE

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

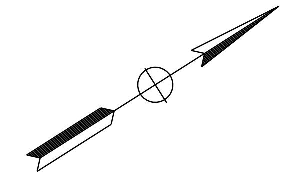
TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

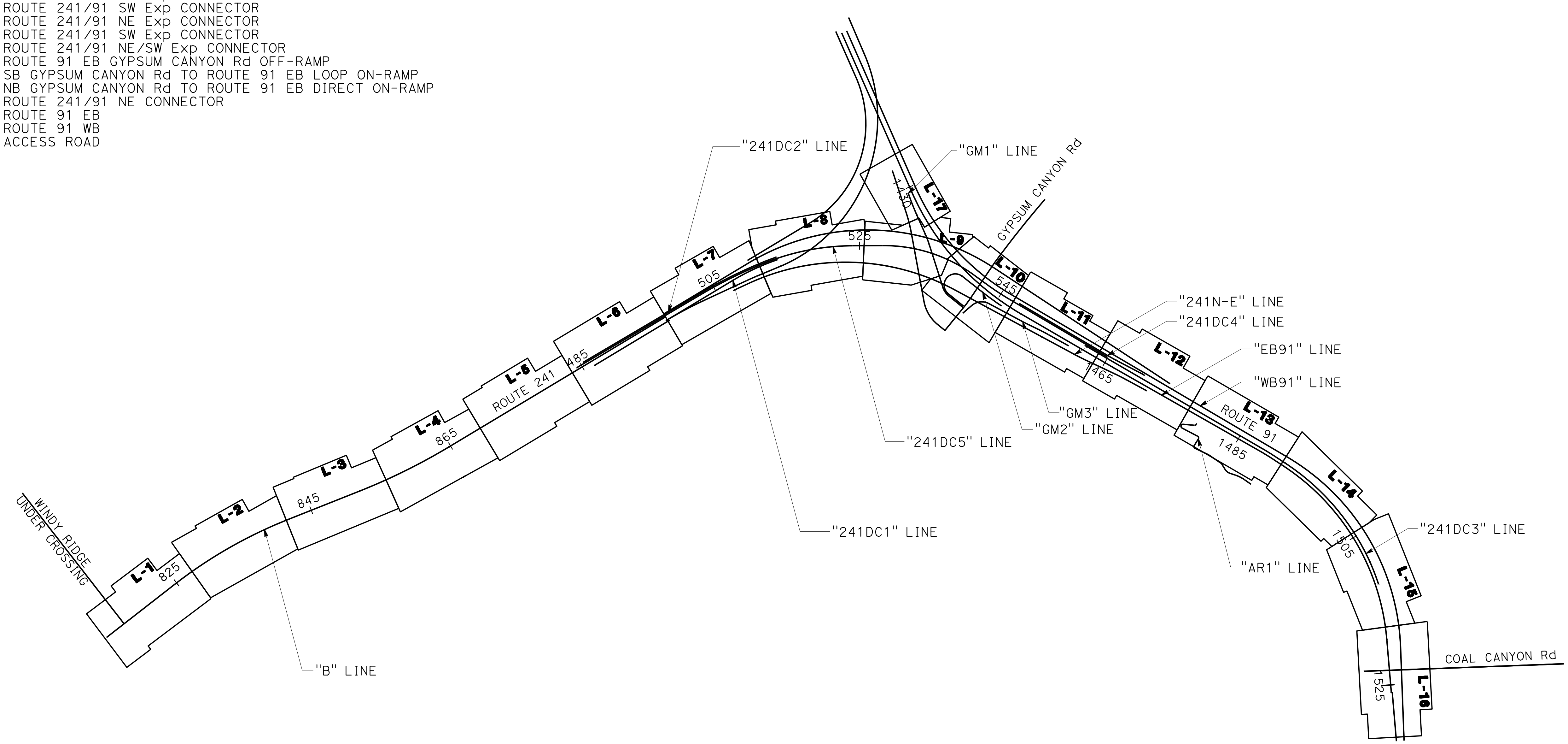
NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LINE INDEX

LINE	DESCRIPTION
"B" LINE	℄ ROUTE 241
"241DC1" LINE	℄ ROUTE 241/91 NE Exp CONNECTOR
"241DC2" LINE	℄ ROUTE 241/91 SW Exp CONNECTOR
"241DC3" LINE	℄ ROUTE 241/91 NE Exp CONNECTOR
"241DC4" LINE	℄ ROUTE 241/91 SW Exp CONNECTOR
"241DC5" LINE	℄ ROUTE 241/91 NE/SW Exp CONNECTOR
"GM1" LINE	℄ ROUTE 91 EB GYPSUM CANYON Rd OFF-RAMP
"GM2" LINE	℄ SB GYPSUM CANYON Rd TO ROUTE 91 EB LOOP ON-RAMP
"GM3" LINE	℄ NB GYPSUM CANYON Rd TO ROUTE 91 EB DIRECT ON-RAMP
"241N-E" LINE	℄ ROUTE 241/91 NE CONNECTOR
"EB91" LINE	℄ ROUTE 91 EB
"WB91" LINE	℄ ROUTE 91 WB
"AR1" LINE	℄ ACCESS ROAD





KEY MAP

NO SCALE

DRAFT

K-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans®

CONSULTANT FUNCTIONAL SUPERVISOR: TIM HAILE

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H:\pdata\10107774\CADD\TransPW\Div\Title_Key_Notes\7774-KM-01.dgn   mohamed.ghonim 19-NOV-2015 19:00

DATE PLOTTED => 19-NOV-2015
TIME PLOTTED => 19:00

LAST REVISION 00-00-14

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER   X/X/XX DATE

PLANS APPROVAL DATE

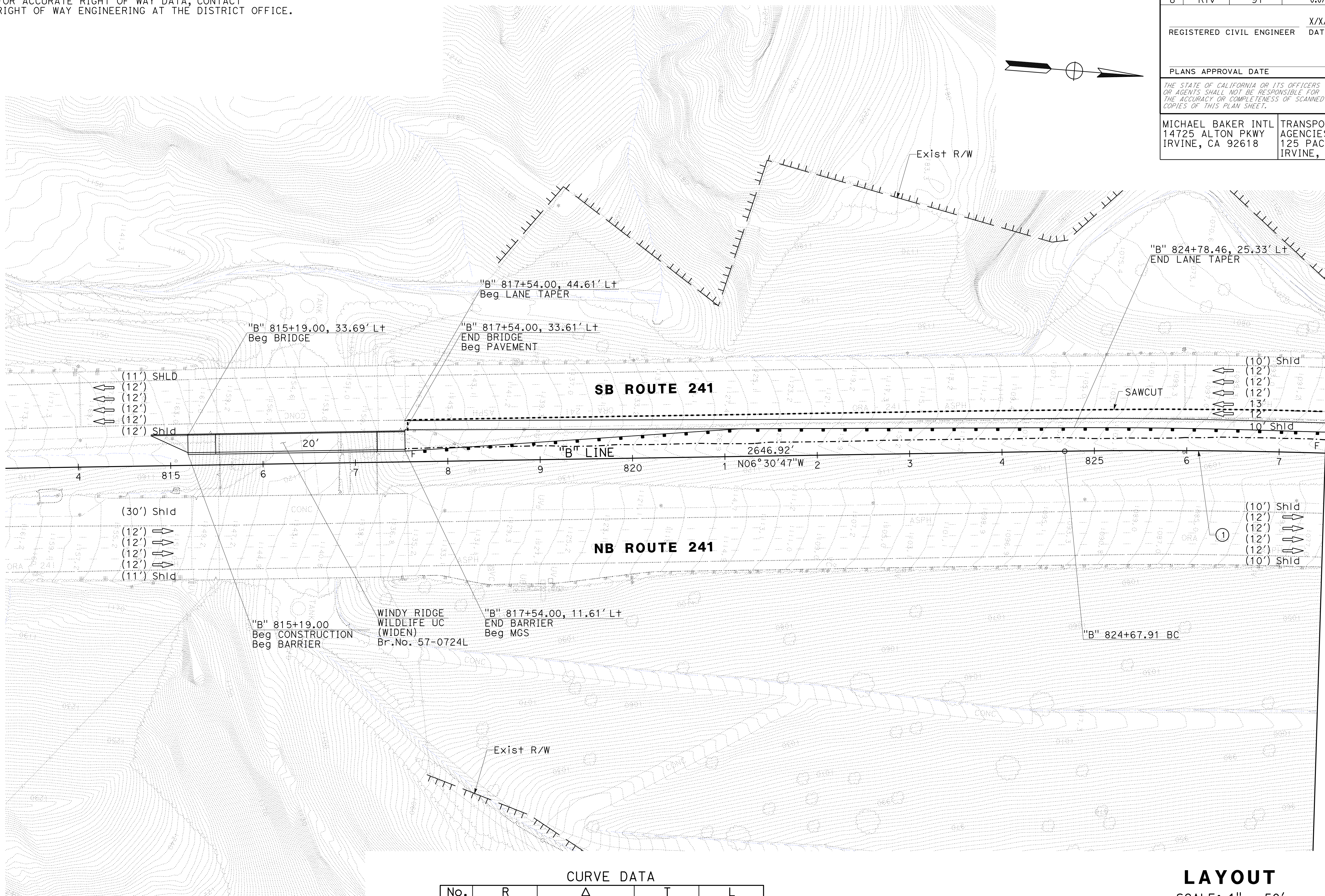
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



CURVE DATA

No.	R	Δ	T	L
1	6000.00	16°15'43"	857.23	1702.95

LAYOUT

SCALE: 1" = 50'

DRAFT

L-1

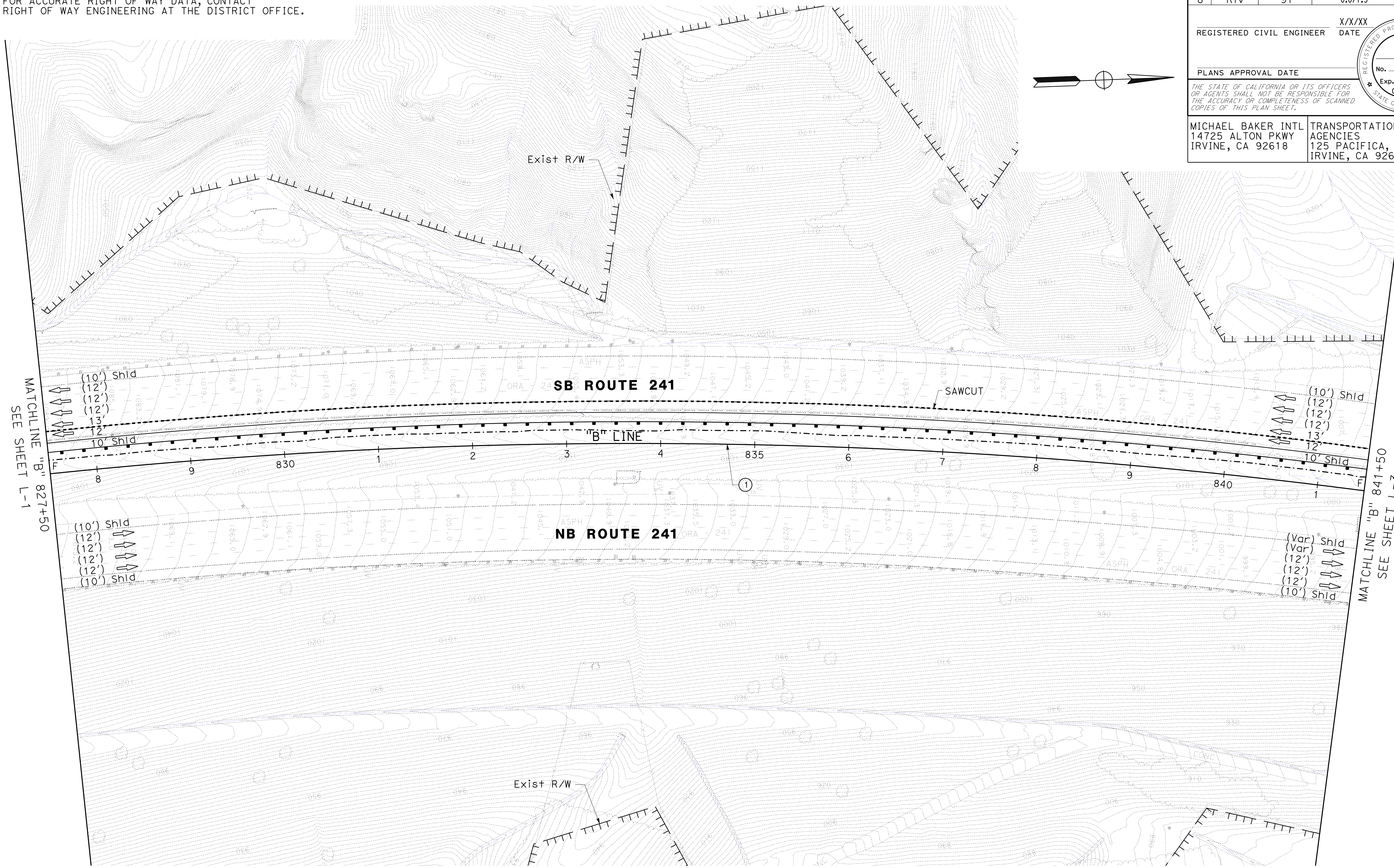
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: TIM HAILE
CALCULATED-DESIGNED BY | CHECKED BY
REVISED BY | DATE REVISED

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-001.dgn
mohamed.ghonim 11-FEB-2016 19:02

LAST REVISION 00-00-14 | DATE PLOTTED => 11-FEB-2016 | TIME PLOTTED => 19:02

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

CURVE DATA

No.	R	Δ	T	L
1	6000.00	16°15'43"	857.23	1702.95

LAYOUT

SCALE: 1" = 50'

DRAFT

L-2

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-002.dgn

mohamed.ghonim 11-FEB-2016 19:02

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

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CHECKED BY

REVISED BY

DATE REVISED

LAST REVISION 00-00-14

DATE PLOTTED => 11-FEB-2016

TIME PLOTTED => 19:02

BORDER LAST REVISED 7/2/2010

USERNAME => mohamed.ghonim

DGN FILE => 7774-ST-002.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 1200020097

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

PLANS APPROVAL DATE

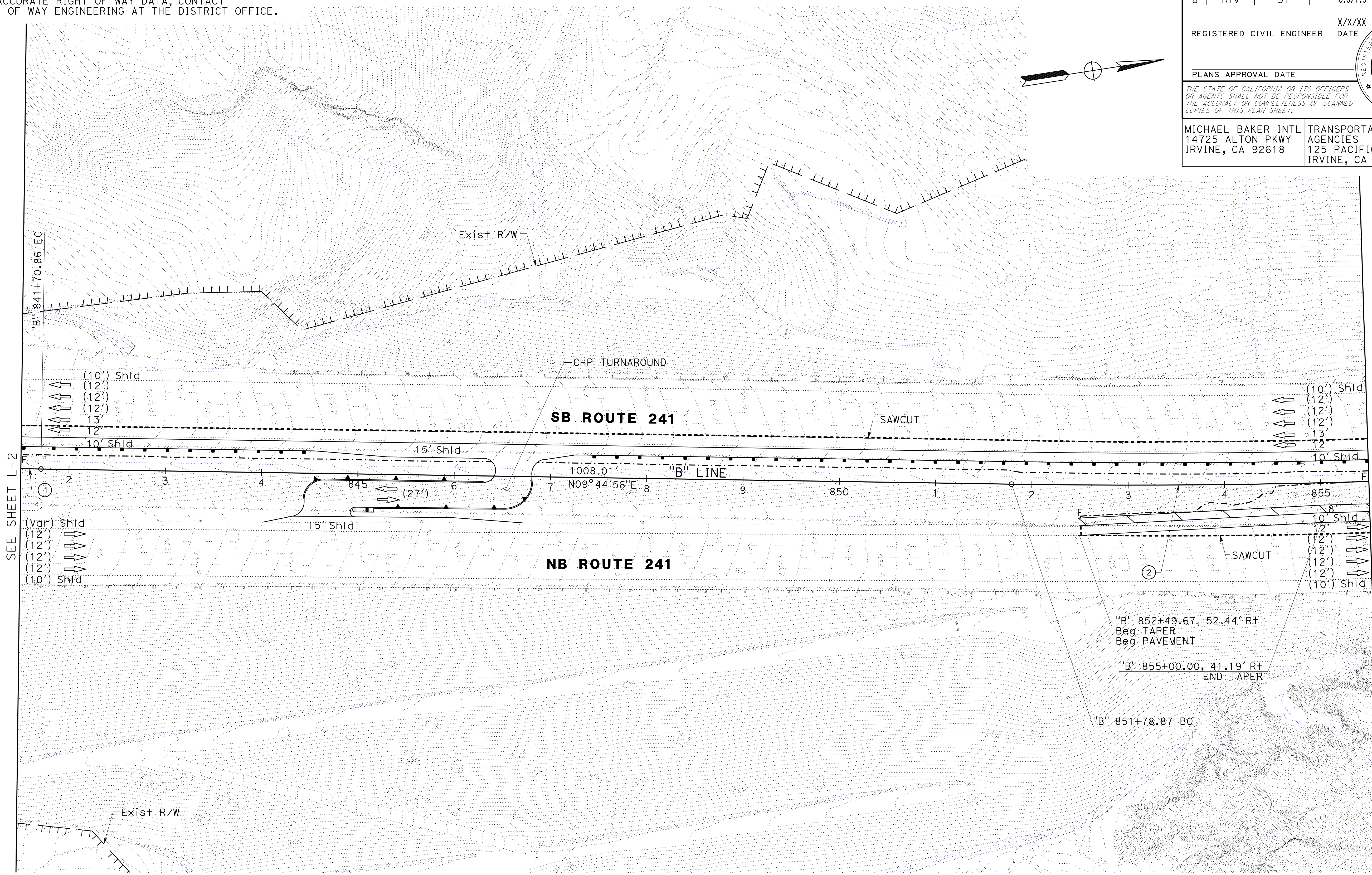
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



CURVE DATA

No.	R	Δ	T	L
1	6000.00	16°15'43"	857.23	1702.95
2	8000.00	09°18'59"	651.85	1300.83

DRAFT

LAYOUT

SCALE: 1" = 50'

L-3

REVISED BY | DATE REVISED | CALCULATED-DESIGNED BY | CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

H:\pdata\10107774\CADD\TransPW\Div\Layout\7774-ST-003.dgn

mohamed.ghonim 11-FEB-2016 19:03

LAST REVISION 00-00-14 | DATE PLOTTED => 11-FEB-2016 | TIME PLOTTED => 19:03

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

PLANS APPROVAL DATE

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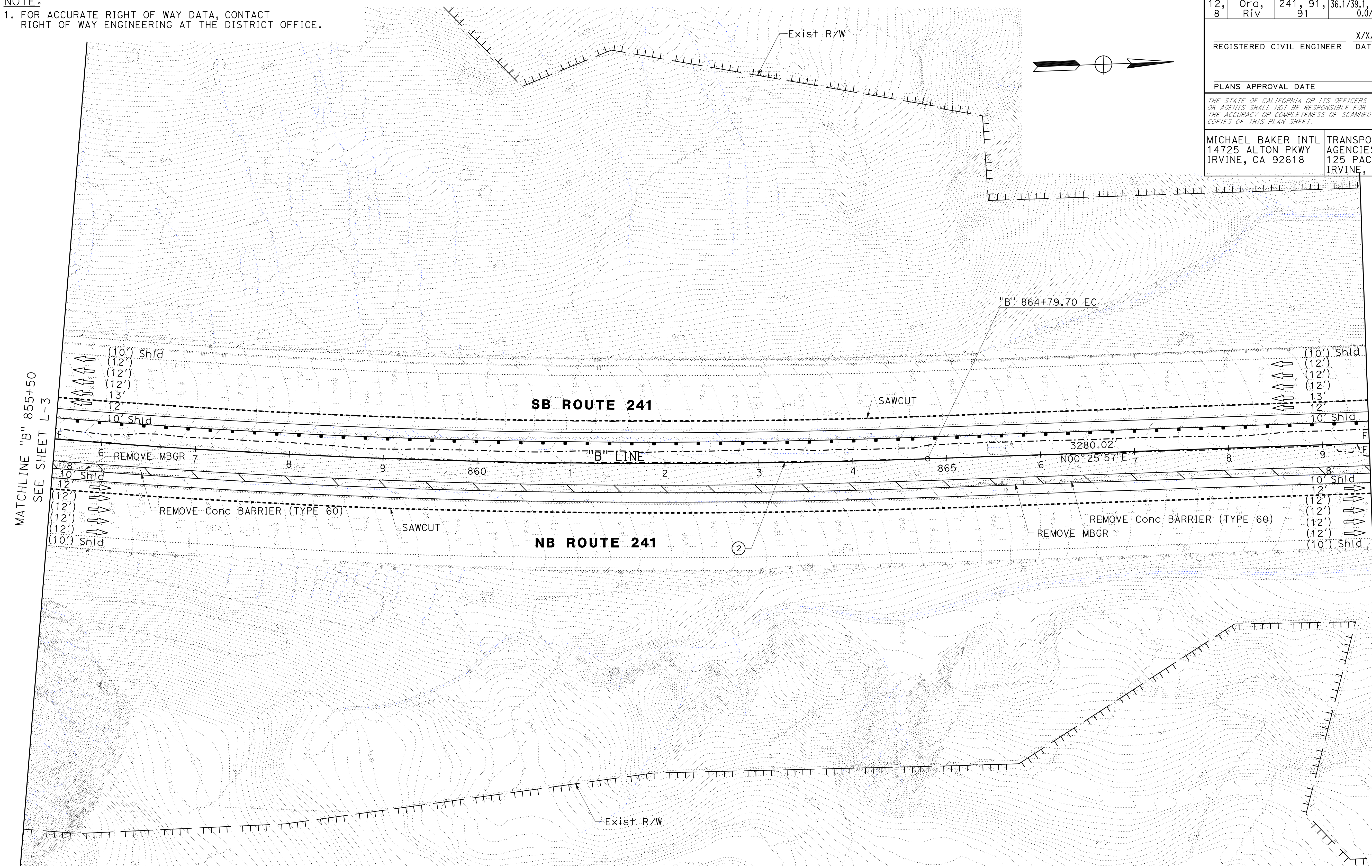
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



CURVE DATA

No.	R	Δ	T	L
(2)	8000.00	09°18'59"	651.85	1300.83

DRAFT

LAYOUT
SCALE: 1" = 50'

L-4

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

CALCULATED-DESIGNED BY CHECKED BY

REVISED BY DATE REVISED

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-004.dgn mohamed.ghonim 11-FEB-2016 19:03

LAST REVISION 00-00-14 DATE PLOTTED => 11-FEB-2016 TIME PLOTTED => 19:03

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

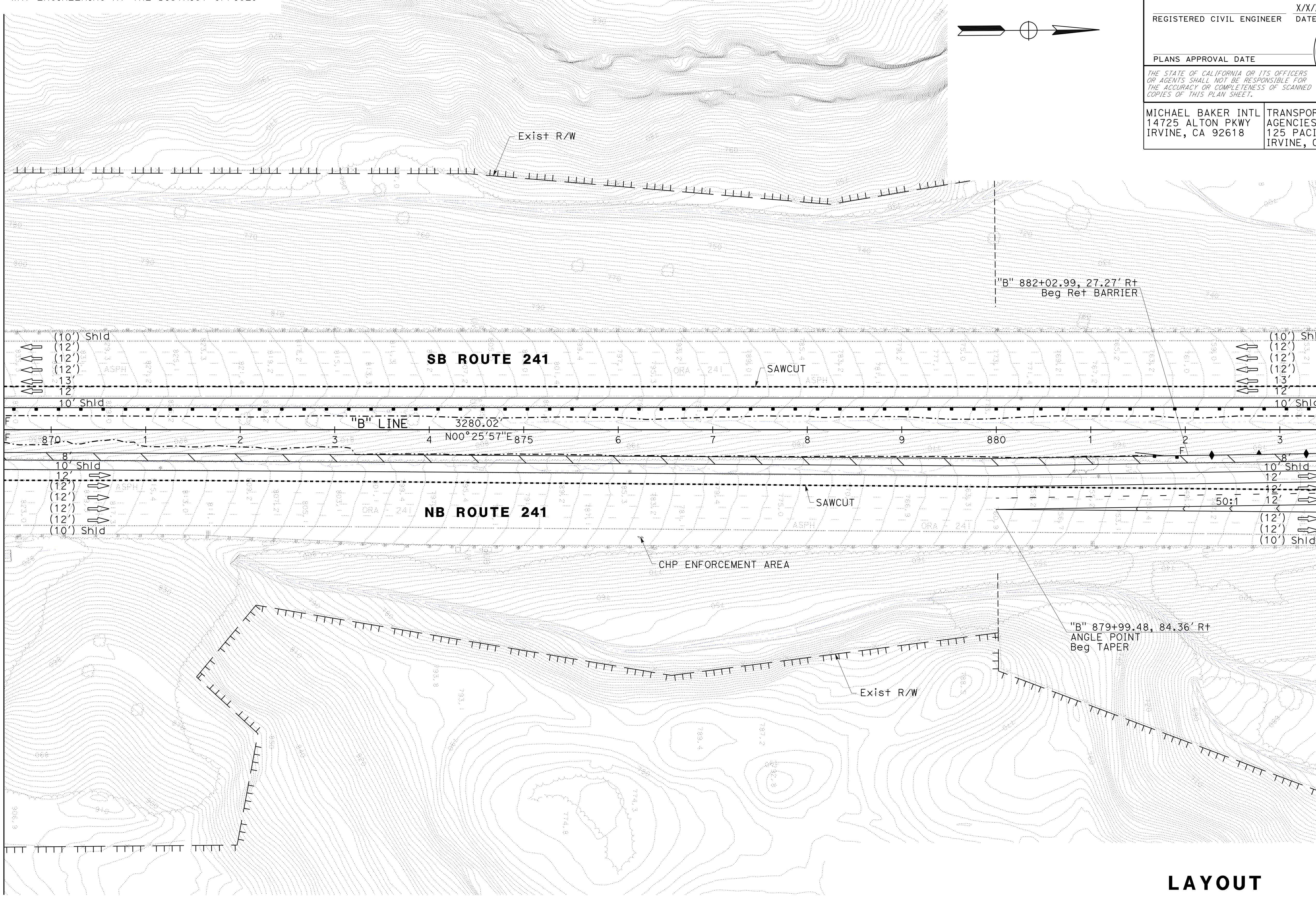
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



LAYOUT

SCALE: 1" = 50'

DRAFT

L-5

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-005.dgn

mohamed.ghonim 11-FEB-2016 19:03

CONSULTANT FUNCTIONAL SUPERVISOR: TIM HAILE

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LAST REVISION 00-00-14 | DATE PLOTTED => 11-FEB-2016 | TIME PLOTTED => 19:03

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER   X/X/XX DATE

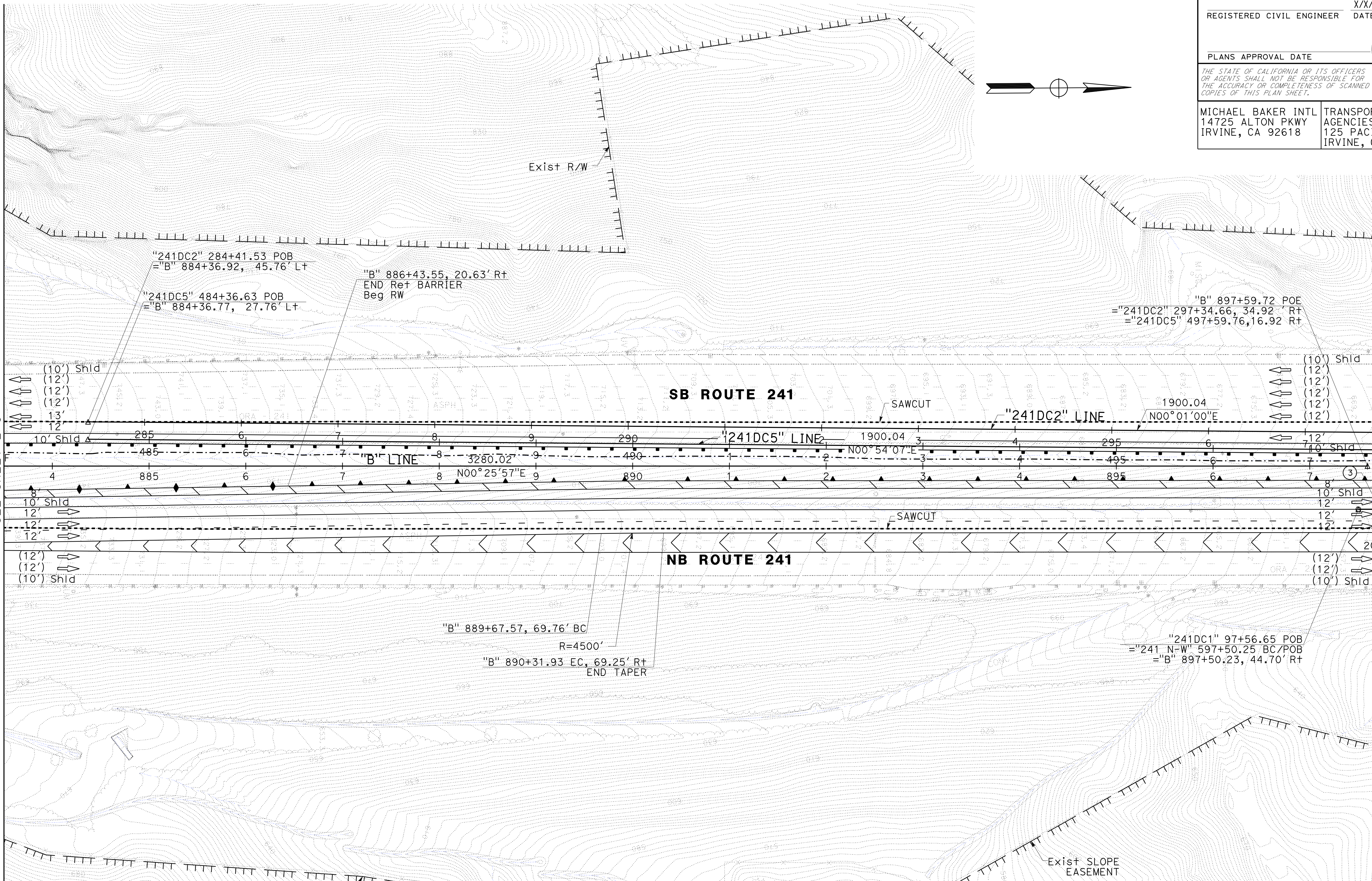
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



CURVE DATA

No.	R	Δ	T	L
(3)	5116.00	06°05'50"	272.47	544.42

LAYOUT

SCALE: 1" = 50'

DRAFT

L-6

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: TIM HAILE

CALCULATED-DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-006.dgn

mohamed.ghonim 11-FEB-2016 19:03

DATE PLOTTED => 11-FEB-2016
TIME PLOTTED => 19:03

LAST REVISION 00-00-14

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT
   RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER DATE X/X/XX

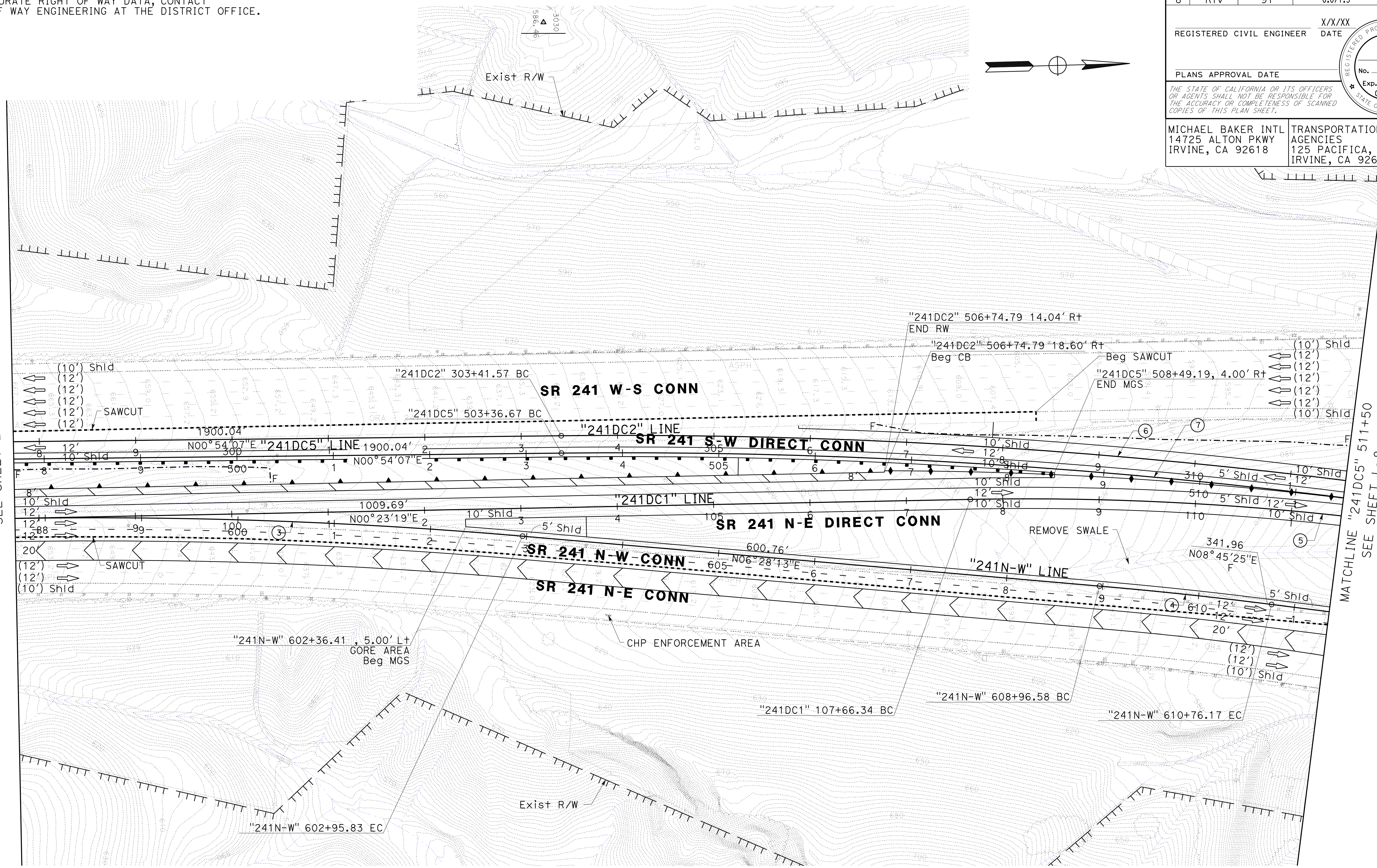
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



CURVE DATA

No.	R	Δ	T	L
3	5140.00	06°04'56"	273.04	545.58
4	4500.00	02°17'12"	89.81	179.59
5	3000.00	12°05'51"	317.90	633.43
6	6000.00	08°40'00"	454.65	907.57
7	5982.00	08°40'00"	453.29	904.85

DRAFT

LAYOUT
SCALE: 1" = 50'

L-7

REVISED BY | DATE REVISED | CALCULATED-DESIGNED BY | CHECKED BY | CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

mohamed.ghonim 12-FEB-2016 09:18

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-007.dgn

LAST REVISION 00-00-14 DATE PLOTTED => 12-FEB-2016 TIME PLOTTED => 09:18

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

PLANS APPROVAL DATE

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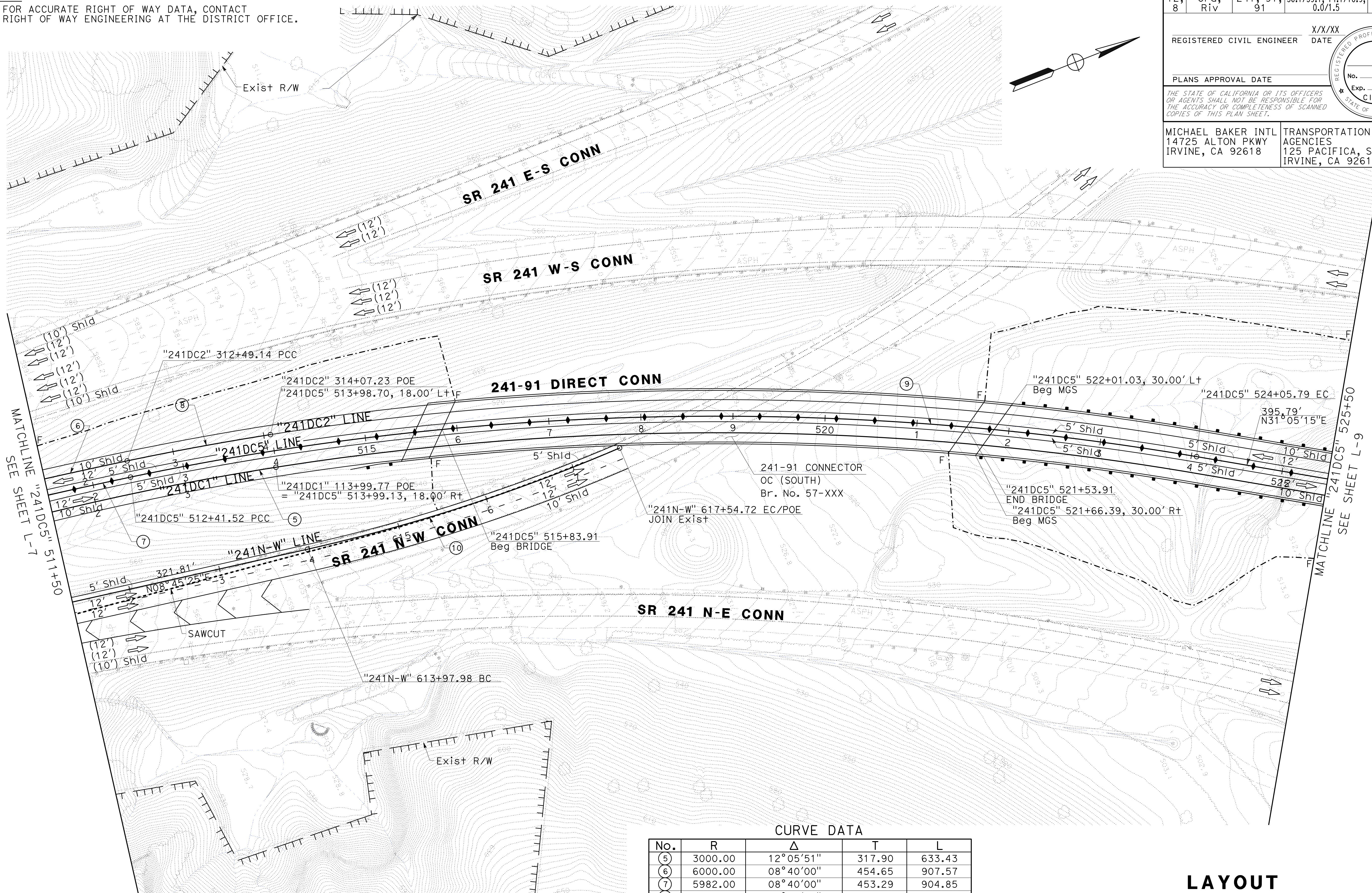
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



CURVE DATA

No.	R	Δ	T	L
5	3000.00	12°05'51"	317.90	633.43
6	6000.00	08°40'00"	454.65	907.57
7	5982.00	08°40'00"	453.29	904.85
8	3118.00	02°54'18"	79.06	158.09
9	3100.00	21°31'07"	589.08	1164.27
10	1926.56	10°36'34"	178.88	356.74

LAYOUT

SCALE: 1" = 50'

DRAFT

L-8

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

CALCULATED-DESIGNED BY CHECKED BY

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mohamed.ghonim 12-FEB-2016 09:19

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LAST REVISION 00-00-14 DATE PLOTTED => 12-FEB-2016 TIME PLOTTED => 09:19

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER DATE X/X/XX

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

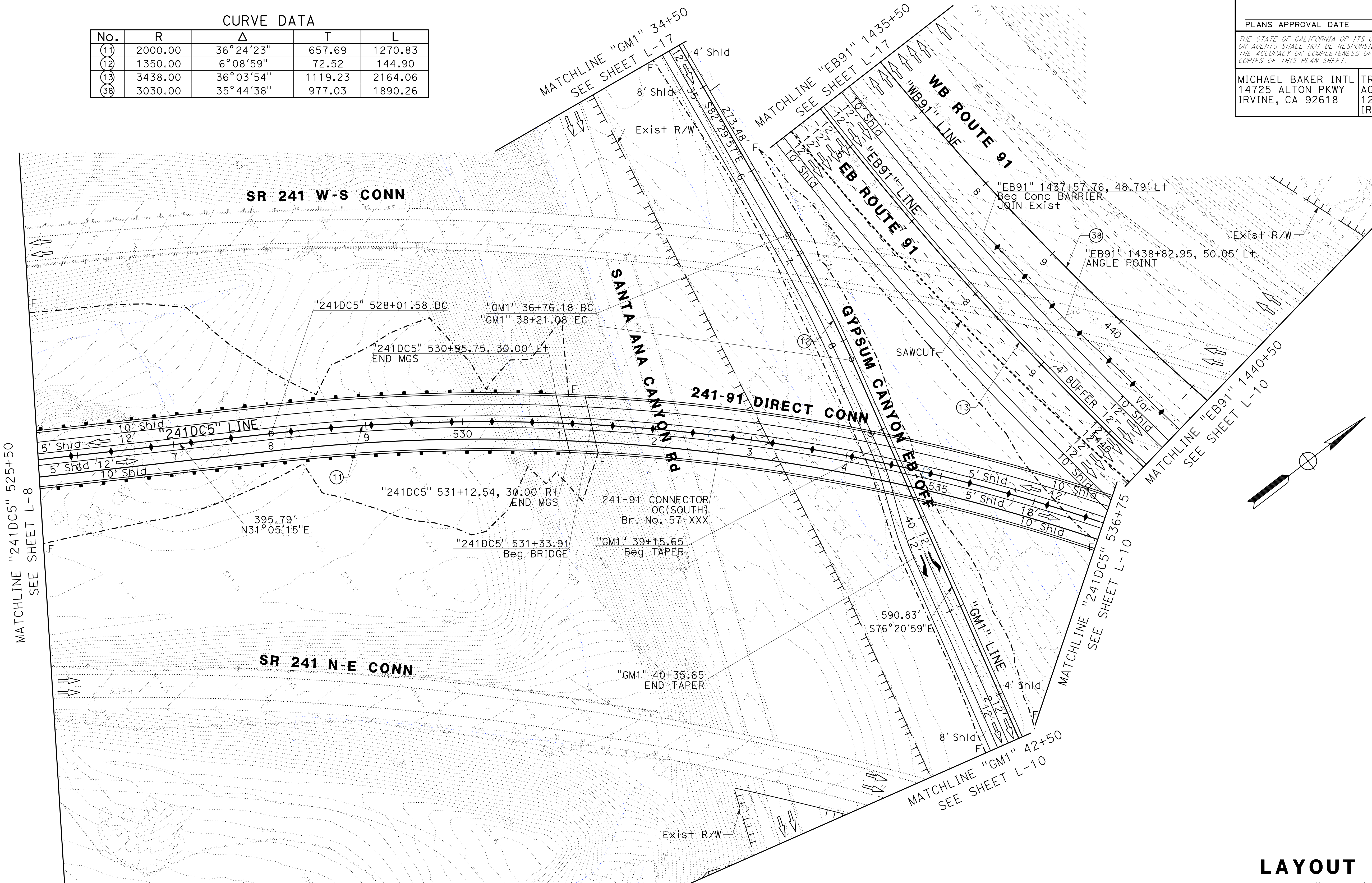
TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L
11	2000.00	36°24'23"	657.69	1270.83
12	1350.00	6°08'59"	72.52	144.90
13	3438.00	36°03'54"	1119.23	2164.06
38	3030.00	35°44'38"	977.03	1890.26



LAYOUT

SCALE: 1" = 50'

DRAFT

L-9

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

CALCULATED-DESIGNED BY CHECKED BY

REVISED BY DATE REVISED

H:\pdata\10107774\CADD\TransPW\Div\Layout\7774-ST-009.dgn mohamed.ghonim 11-FEB-2016 19:03

BORDER LAST REVISED 7/2/2010

USERNAME => mohamed.ghonim
DGN FILE => 7774-ST-009.dgn

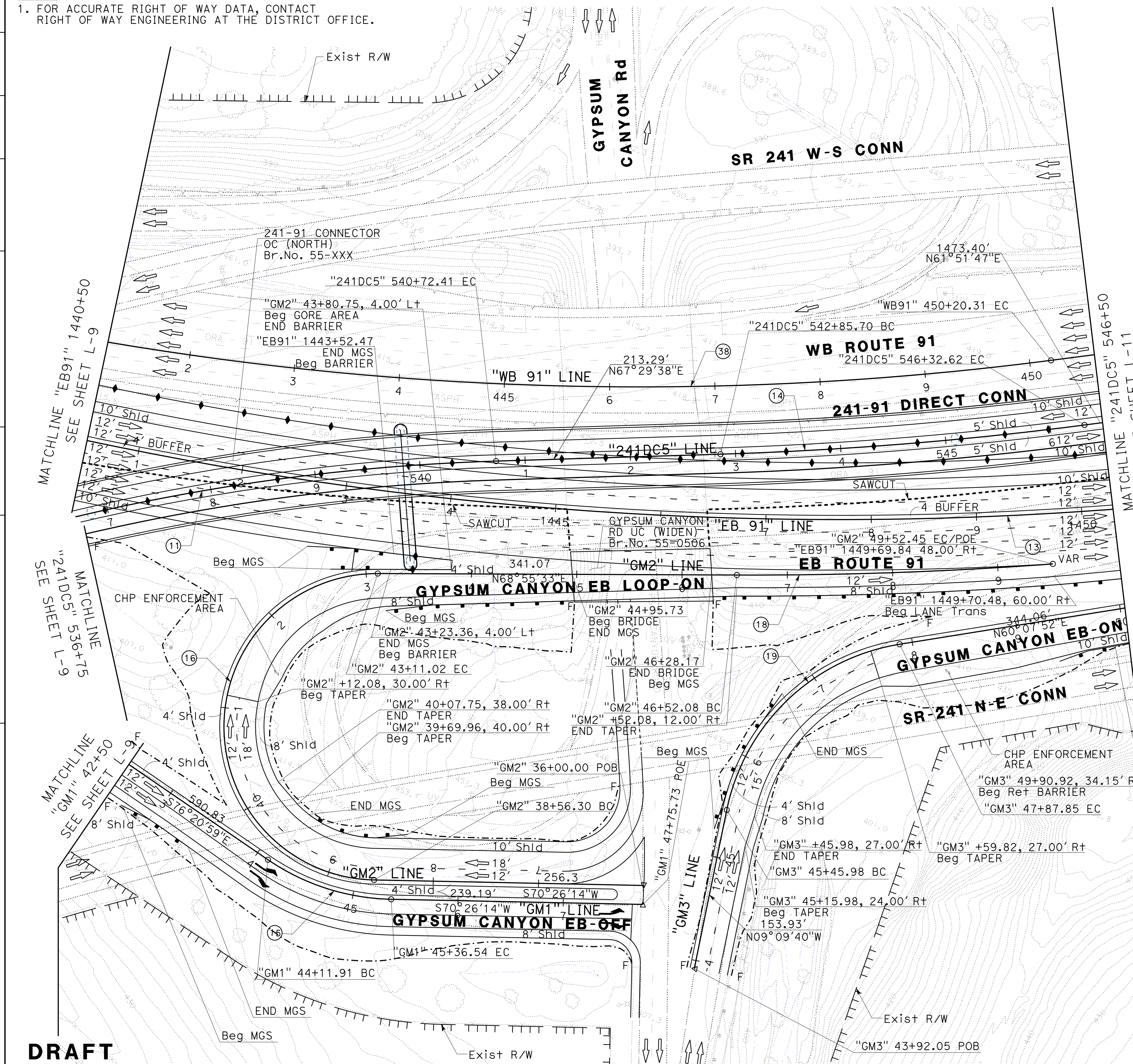
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 1200020097

LAST REVISION 00-00-14 DATE PLOTTED => 11-FEB-2016 TIME PLOTTED => 19:03

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



CURVE DATA

No.	R	Δ	T	L
11	2000.00	36°24'23"	657.69	1270.83
13	3438.00	36°03'54"	1119.23	2164.06
14	3530.00	5°37'51"	173.60	346.92
15	215.00	33°12'47"	64.12	124.63
16	145.50	179°03'35"	16961.33	454.72
18	3827.85	4°29'45"	150.26	300.37
19	200.00	69°17'32"	138.21	241.87
38	3030.00	35°44'38"	977.03	1890.26

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER DATE X/X/XX

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

LAYOUT

SCALE: 1" = 50'

DRAFT

L-10

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-010.dgn

mohamed.ghonim 11-FEB-2016 19:03

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: TIM HAILE

CALCULATED-DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

LAST REVISION 00-00-14 | DATE PLOTTED => 11-FEB-2016 | TIME PLOTTED => 19:03

BORDER LAST REVISED 7/2/2010 | USERNAME => mohamed.ghonim | DGN FILE => 7774-ST-010.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0000 | PROJECT NUMBER & PHASE 1200020097

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

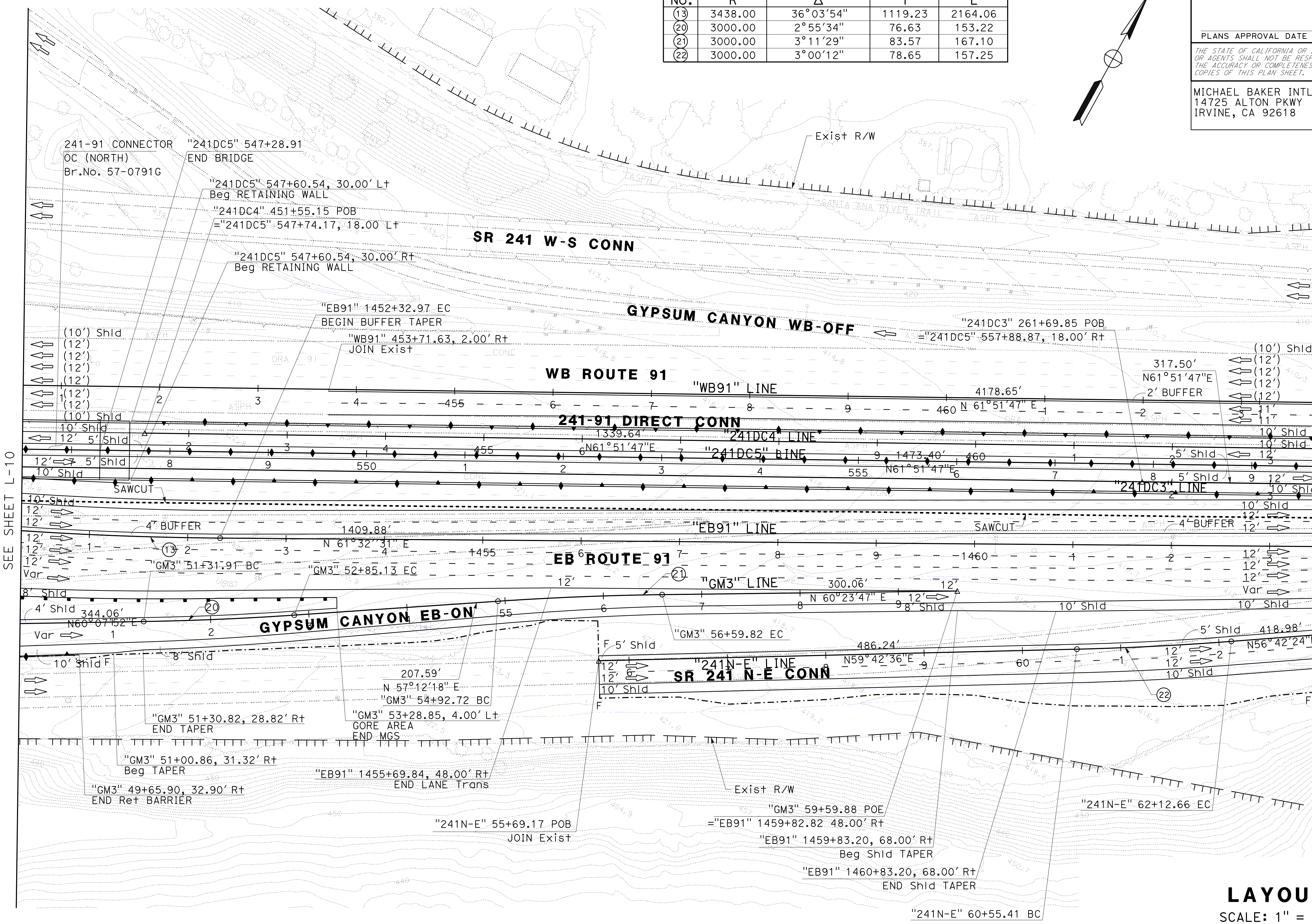
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

CURVE DATA

No.	R	Δ	T	L
13	3438.00	36°03'54"	1119.23	2164.06
20	3000.00	2°55'34"	76.63	153.22
21	3000.00	3°11'29"	83.57	167.10
22	3000.00	3°00'12"	78.65	157.25



LAYOUT
SCALE: 1" = 50'

DRAFT

L-11

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

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CALCULATED-DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

mohamed.ghonim 11-FEB-2016 19:03

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-011.dgn

DATE PLOTTED => 11-FEB-2016
TIME PLOTTED => 19:03
LAST REVISION 00-00-14

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER DATE X/X/XX

PLANS APPROVAL DATE

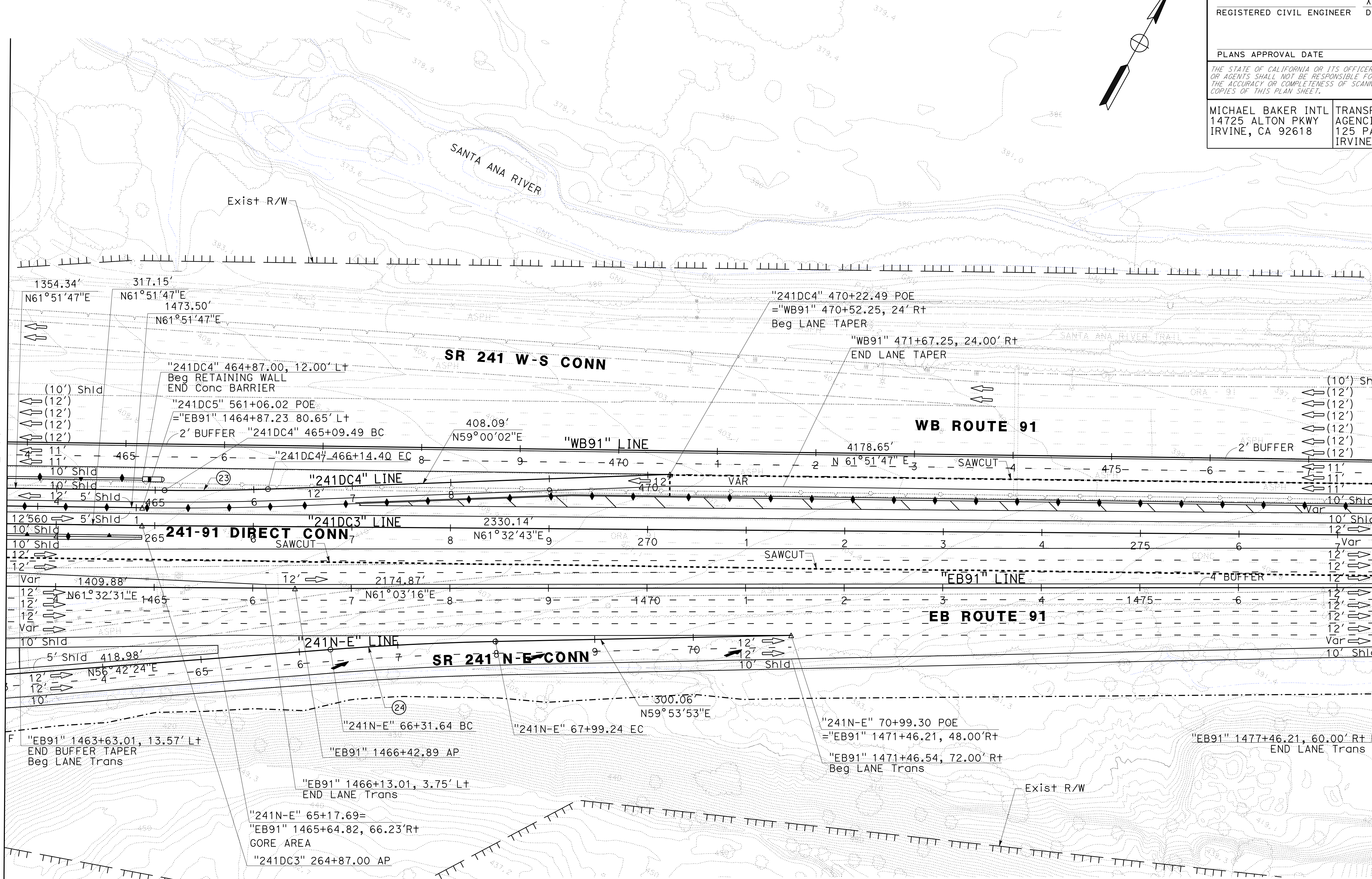
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



CURVE DATA

No.	R	Δ	T	L
23	2100.00	2°51'45"	52.47	104.91
24	3000.00	3°12'04"	83.83	167.60

DRAFT

LAYOUT

SCALE: 1" = 50'

L-12

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

CALCULATED-DESIGNED BY CHECKED BY

REVISED BY DATE REVISED

H:\pdata\10107774\CADD\TransPW\Dlv\Layout\7774-ST-012.dgn

mohamed.ghonim 11-FEB-2016 19:03

LAST REVISION 00-00-14

DATE PLOTTED => 11-FEB-2016 TIME PLOTTED => 19:03

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L
25	3232.00	03°34'34"	100.75	201.43
26	3276.00	03°05'07"	102.27	204.47
27	25.00	65°27'12"	16.07	28.56
28	26.00	157°22'45"	129.99	71.42
29	25.00	94°29'20"	27.04	41.23
30	25.00	96°34'33"	28.05	42.14
31	100.00	08°30'10"	7.43	14.84
32	50.00	24°19'44"	10.78	21.23
33	120.00	40°02'14"	43.72	83.85
34	450.00	16°44'19"	66.20	131.46

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER DATE X/X/XX

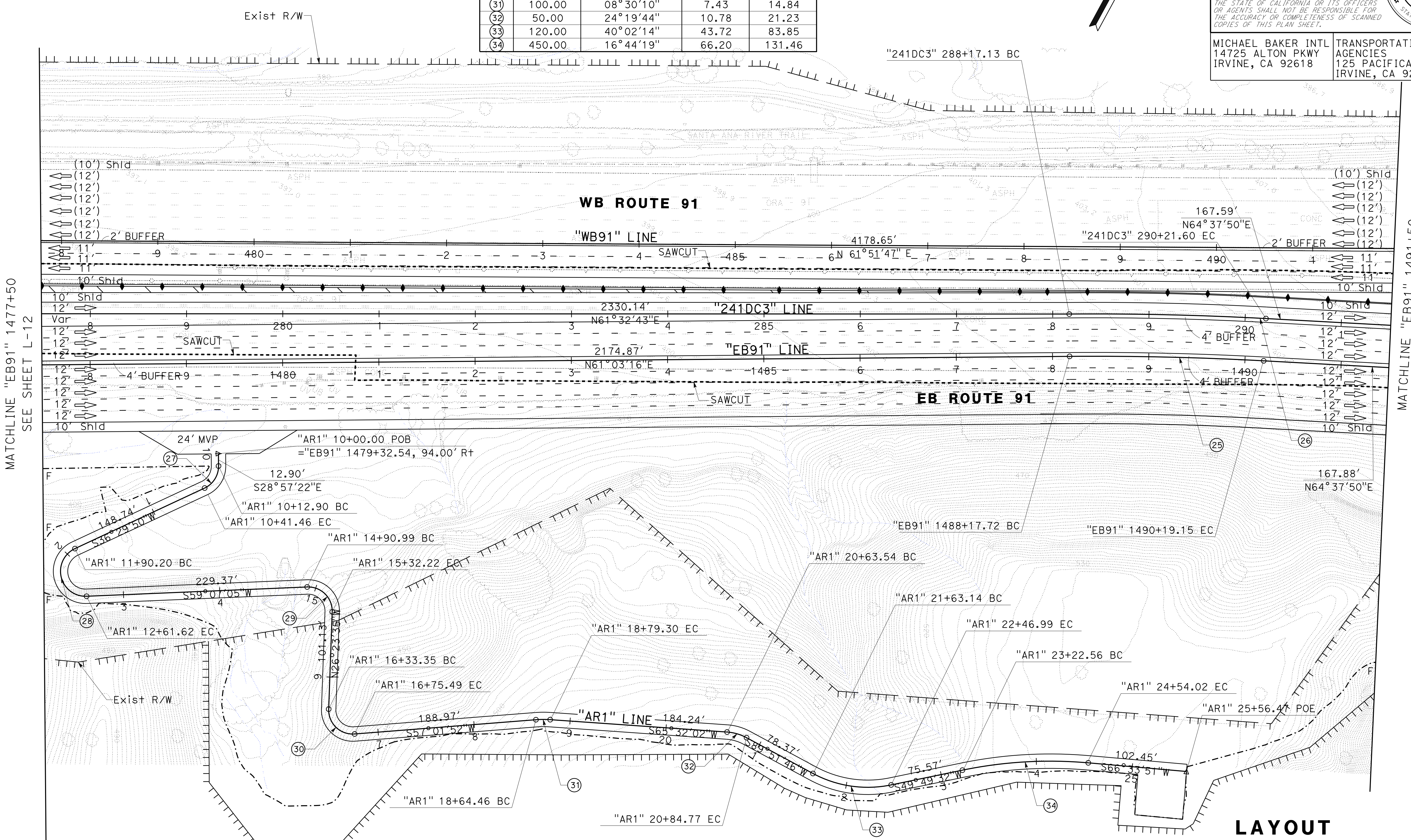
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



LAYOUT
SCALE: 1" = 50'

DRAFT

L-13

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: TIM HAILE

CALCULATED-DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

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mohamed.ghonim 11-FEB-2016 19:03

LAST REVISION 00-00-14 | DATE PLOTTED => 11-FEB-2016 | TIME PLOTTED => 19:03

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

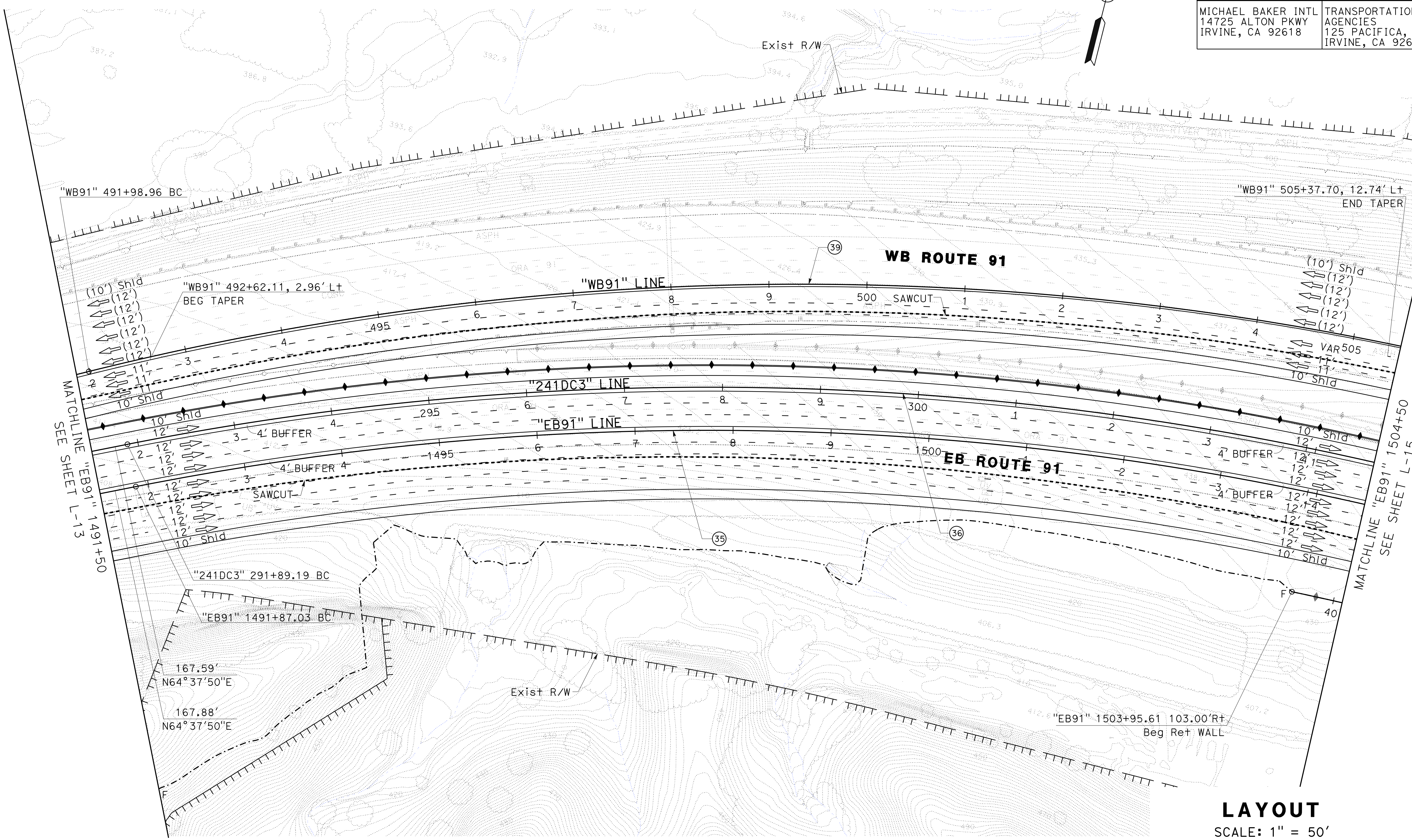
TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L
35	3000.00	51°52'00"	1458.88	2715.73
36	3044.00	38°07'54"	1052.05	2025.86
39	3000.00	57°24'04"	1642.49	3005.52



LAYOUT

SCALE: 1" = 50'

DRAFT

L-14

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: TIM HAILE

CALCULATED-DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

H:\pdata\10107774\CADD\TransPW\Div\Layout\7774-ST-014.dgn mohamed.ghonim 11-FEB-2016 19:03

LAST REVISION 00-00-14 | DATE PLOTTED => 11-FEB-2016 | TIME PLOTTED => 19:03

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

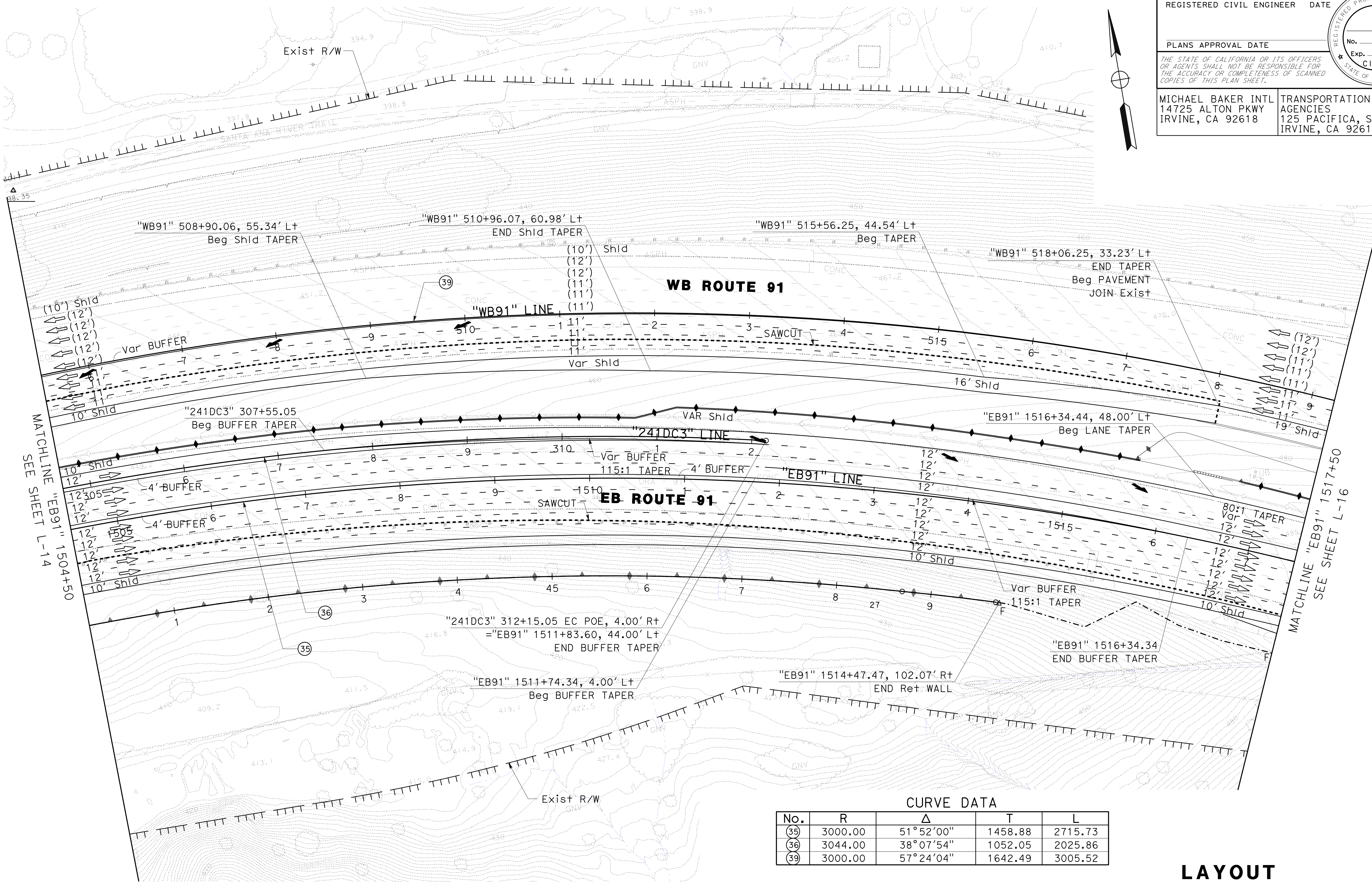
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



CURVE DATA

No.	R	Δ	T	L
35	3000.00	51°52'00"	1458.88	2715.73
36	3044.00	38°07'54"	1052.05	2025.86
39	3000.00	57°24'04"	1642.49	3005.52

LAYOUT

SCALE: 1" = 50'

DRAFT

L-15

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE

CALCULATED-DESIGNED BY | CHECKED BY

REVISED BY | DATE REVISED

H:\pdata\10107774\CADD\TransPW\Div\Layout\7774-ST-015.dgn mohamed.ghonim 11-FEB-2016 19:03

LAST REVISION 00-00-14 | DATE PLOTTED => 11-FEB-2016 | TIME PLOTTED => 19:03

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L
35	3000.00	51°52'00"	1458.88	2715.73
39	3000.00	57°24'04"	1642.49	3005.52

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER X/X/XX DATE

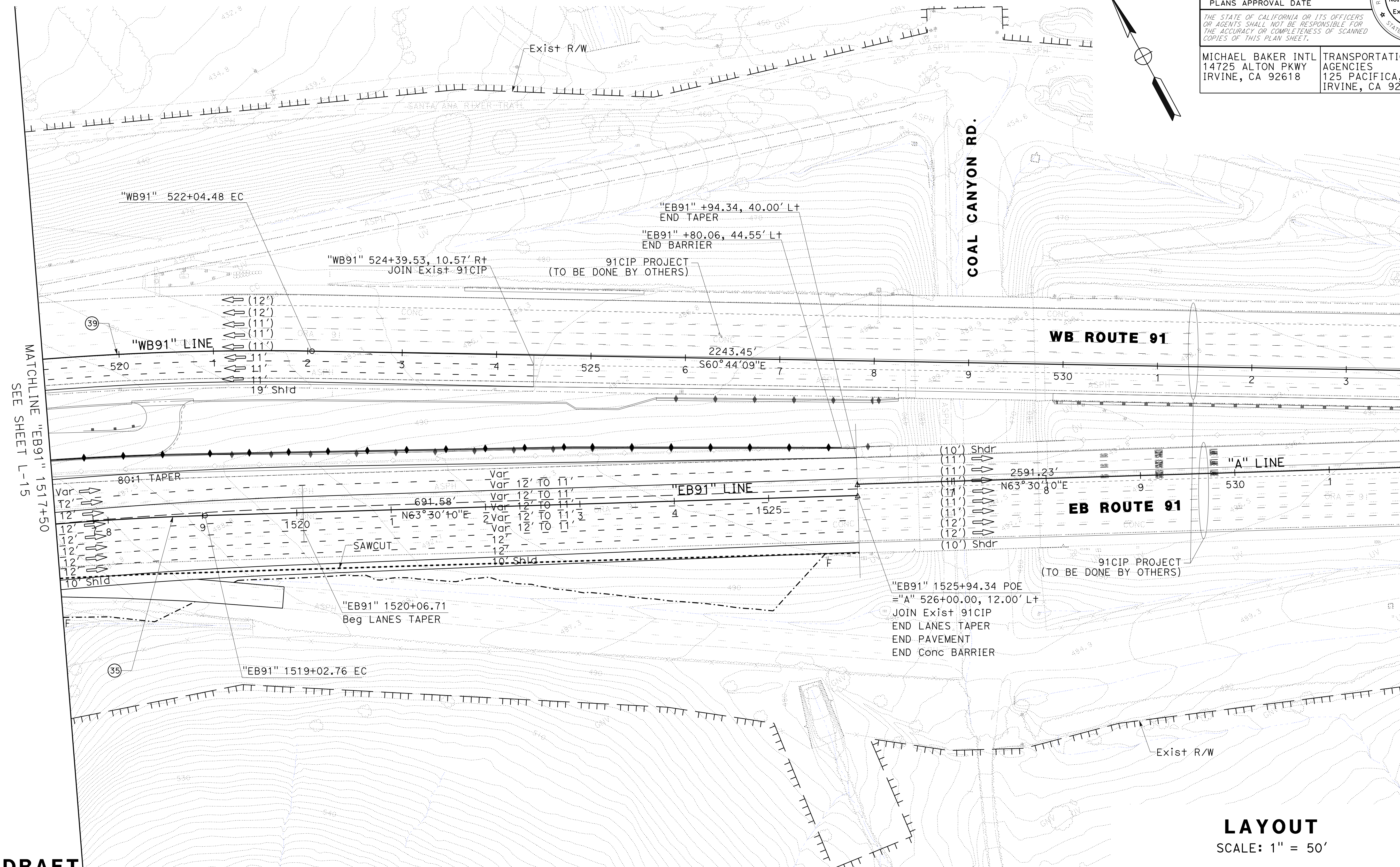
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618



DRAFT

LAYOUT
SCALE: 1" = 50'

L-16

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR TIM HAILE
CALCULATED-DESIGNED BY
CHECKED BY
REVISED BY
DATE REVISED

H:\pdata\10107774\CADD\TransPW\Div\Layout\7774-ST-016.dgn
mohamed.ghonim 11-FEB-2016 19:03

BORDER LAST REVISED 7/2/2010
USERNAME => mohamed.ghonim
DGN FILE => 7774-ST-016.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0000
PROJECT NUMBER & PHASE 1200020097
LAST REVISION 00-00-14
DATE PLOTTED => 11-FEB-2016
TIME PLOTTED => 19:03

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12, 8	Ora, Riv	241, 91, 91	36.1/39.1, 14.7/18.9, 0.0/1.5		

REGISTERED CIVIL ENGINEER DATE X/X/XX

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

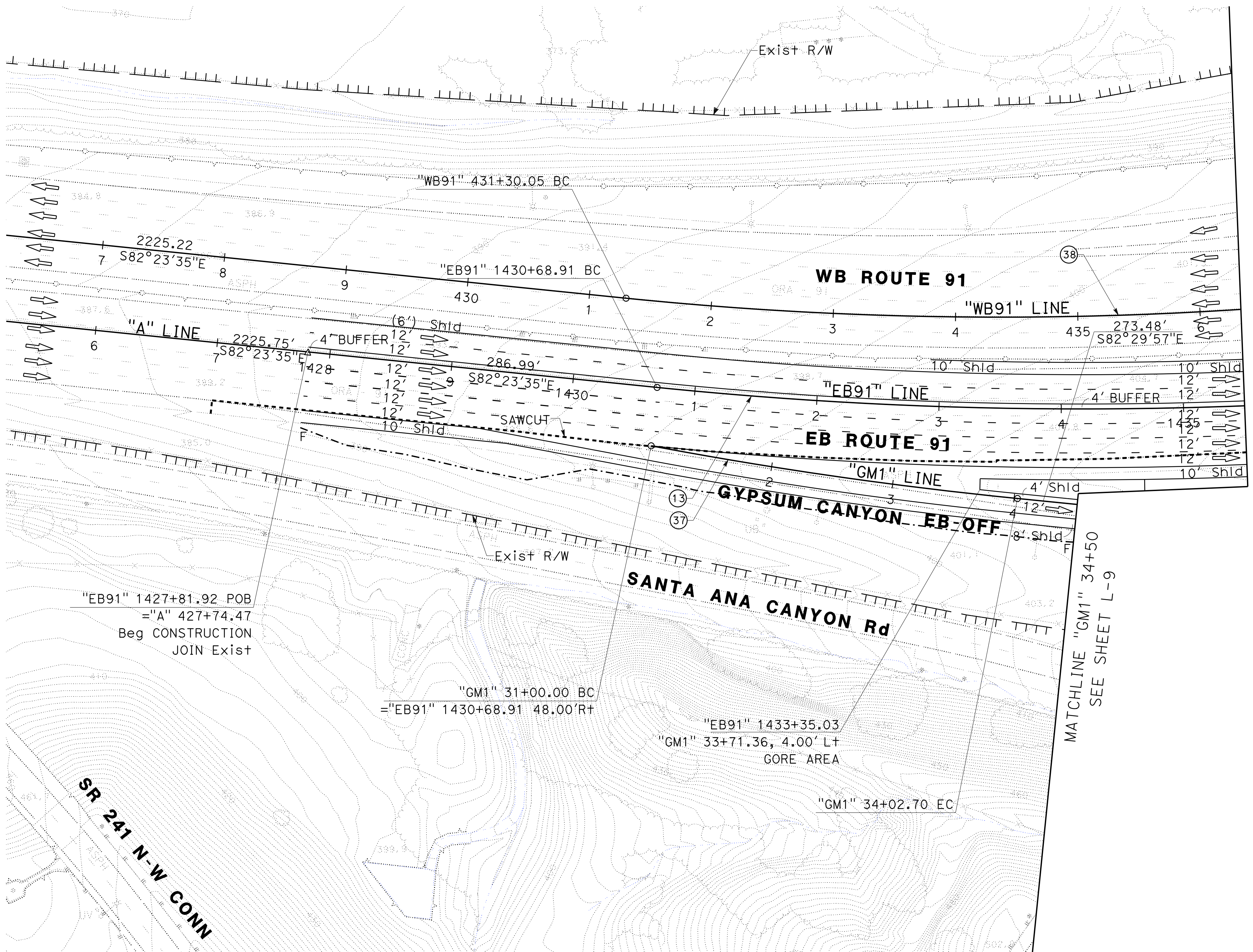
MICHAEL BAKER INTL
14725 ALTON PKWY
IRVINE, CA 92618

TRANSPORTATION CORRIDOR AGENCIES
125 PACIFICA, SUITE 100
IRVINE, CA 92618

NOTE:
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L
13	3438.00	36°03′54"	1119.23	2164.06
37	3486.00	4°58′31"	151.44	302.70
38	3030.00	35°44′38"	977.05	1890.26



LAYOUT

SCALE: 1" = 50′

DRAFT

L-17

REVISED BY | DATE REVISED | CALCULATED-DESIGNED BY | CHECKED BY | CONSULTANT FUNCTIONAL SUPERVISOR | TIM HAILE

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

H:\pdata\10107774\CADD\TransPW\Div\Layout\7774-ST-017.dgn mohamed.ghonim 11-FEB-2016 19:03

LAST REVISION 00-00-14 DATE PLOTTED => 11-FEB-2016 TIME PLOTTED => 19:03

Appendix B
As-built Log of Test Boring

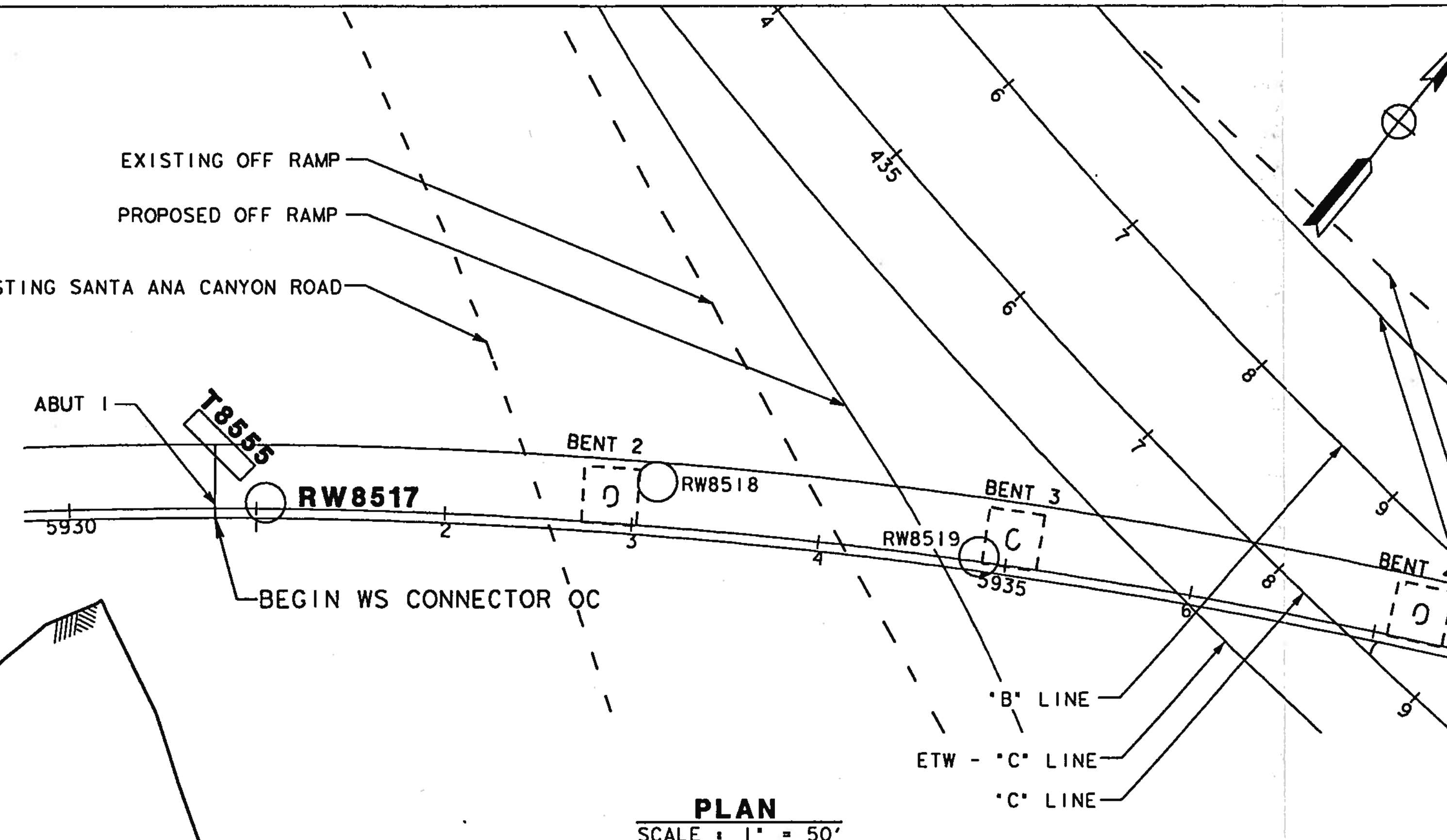
NOTE:

BENCHMARK: 3R 61A 80, MSL ELEV. 406.173. ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

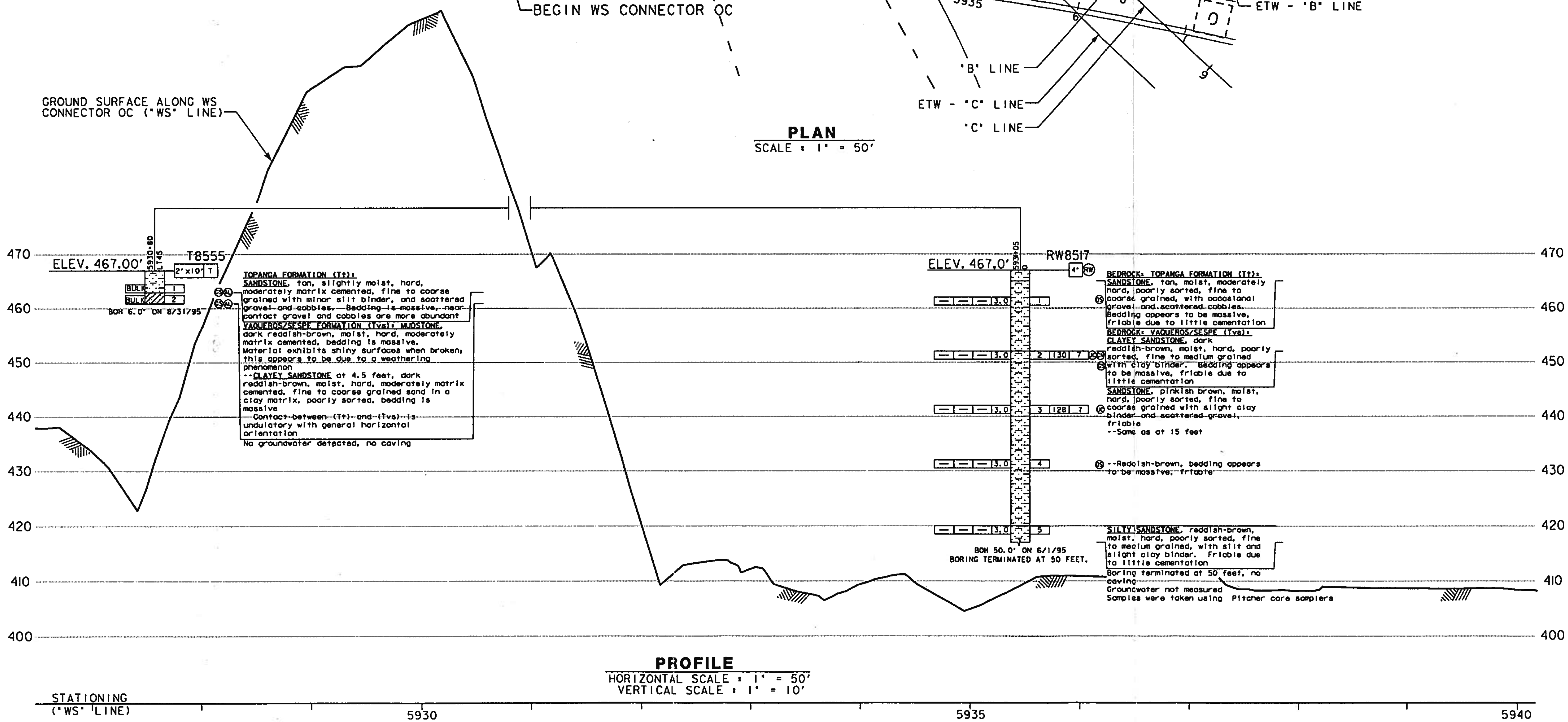
PITCHER CORE SAMPLERS WERE USED TO COLLECT SAMPLES FROM BORING RW8517

LEGEND

- HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)
- HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY CH2M HILL)
- TEST PIT (DONE BY CH2M HILL)



PLAN
SCALE : 1" = 50'



PROFILE
HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'

LEGEND OF BORING OPERATIONS

ELECTRONIC CONE PENETROMETER TEST ASTM D3441-86

HOLLOW/BUCKET/ROTARY SAMPLE BORING

NOTES:
1. TYPES OF BORINGS: BUCKET AUGER, HOLLOW STEM AUGER, ROTARY WASH, TEST PIT, CONE PENETROMETER
2. SOIL TEST DESIGNATIONS: ATTERBERG LIMITS, CONSOLIDATION, CHEMICAL ANALYSIS, SIEVE ANALYSIS, MAX. DRY DENSITY, POCKET PENETROMETER, R-VALUE, UNCONFINED COMPRESSION, DIRECT SHEAR, UNCONSOLIDATED UNDRAINED TRIAXIAL

LEGEND OF EARTH MATERIALS (USCS): CL LEAN CLAY; ML SILT; OL ORGANIC CLAY OR SILT; CH FAT CLAY; MH ELASTIC SILT; OH ORGANIC CLAY OR SILT; GW WELL-GRADED GRAVEL; GP POORLY-GRADED GRAVEL; GM SILTY GRAVEL; GC CLAYEY GRAVEL; SW WELL-GRADED SAND; SP POORLY-GRADED SAND; SM SILTY SAND; SC CLAYEY SAND; SANDSTONE; SHALE; CLAYSTONE; SILTSTONE

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION ASTM D1586

Sands and Gravels Consistency	Blows/Foot
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	Over 50

Clays and Silts Consistency	Blows/Foot
Very soft	0 - 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very stiff	15 - 30
Hard	Over 30

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — LAWRENCE N. PERKO — No. 2136 — Exp. 6/30/97 — GEOTECHNICAL — STATE OF CALIFORNIA

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

CALTRANS DESIGN OVERSIGHT

DRAWN BY J. CRAWLEY
CHECKED BY S. JAGANNATH

CH2M HILL
FIELD INVESTIGATOR
DATE 4/6/95-6/1/95

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-794F
POST MILE 39.02

WS CONNECTOR OVERCROSSING
LOG OF TEST BORINGS 2-7

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 6/12 11/1

SHEET 1 OF 10

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

NOTE:

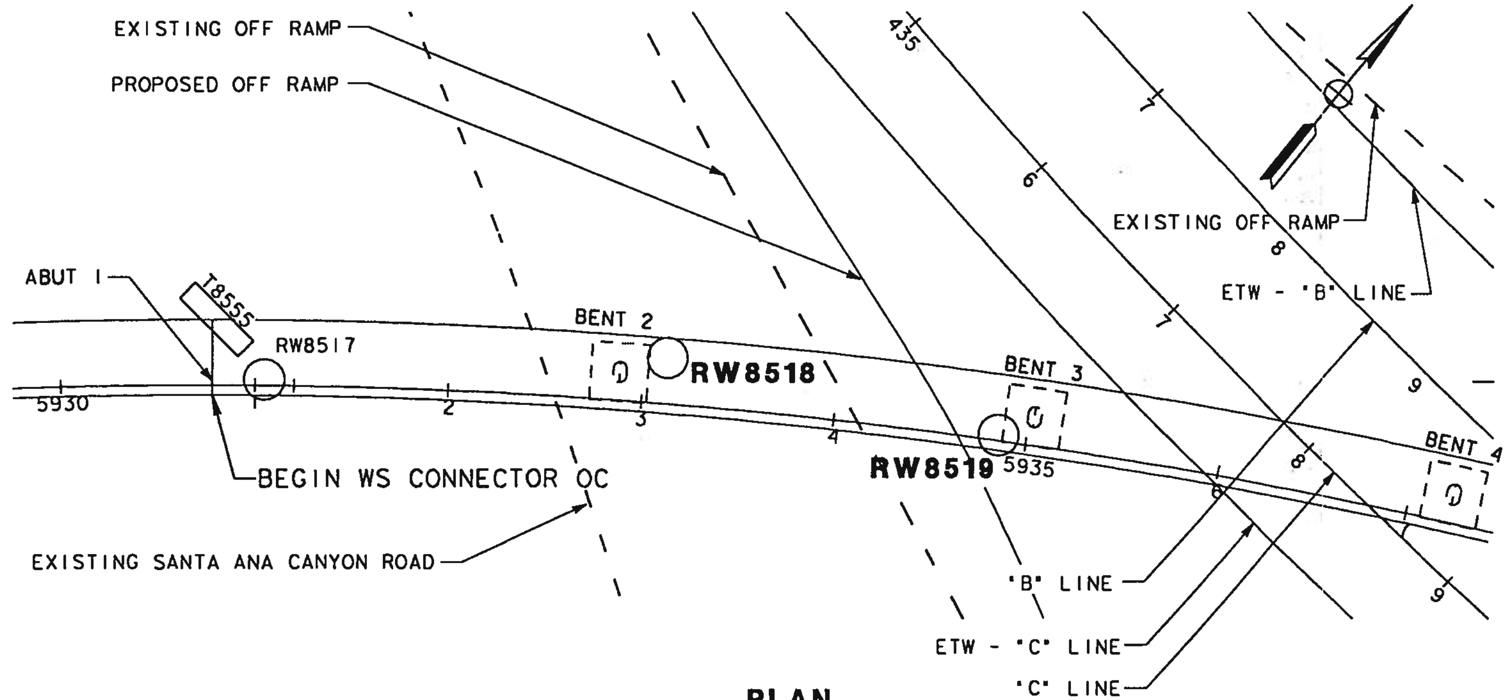
BENCHMARK: 3R 61A 80, MSL ELEV. 406.173.
ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

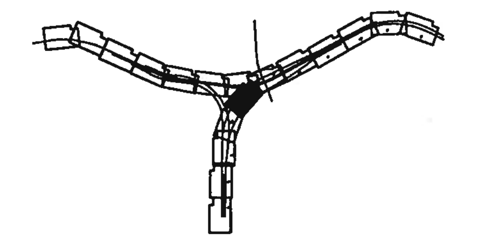
HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY CH2M HILL)

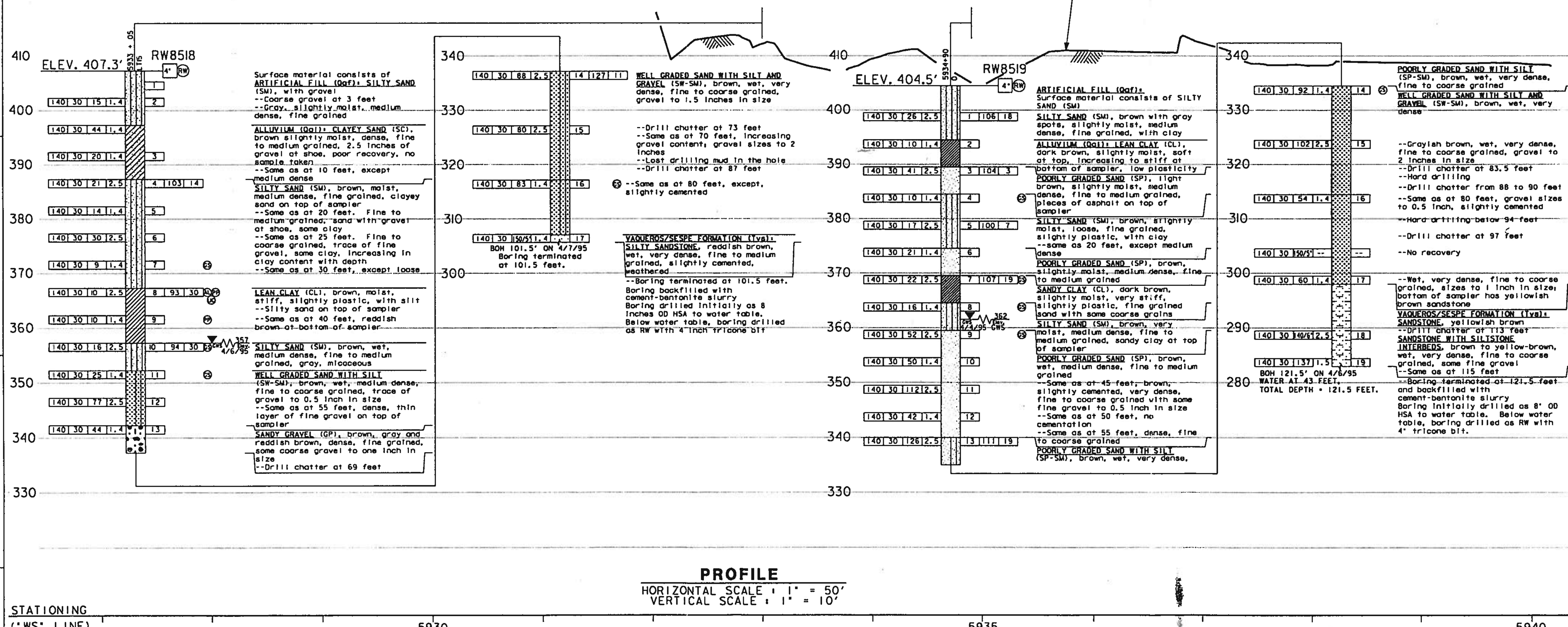
TEST PIT (DONE BY CH2M HILL)



PLAN

SCALE : 1" = 50'

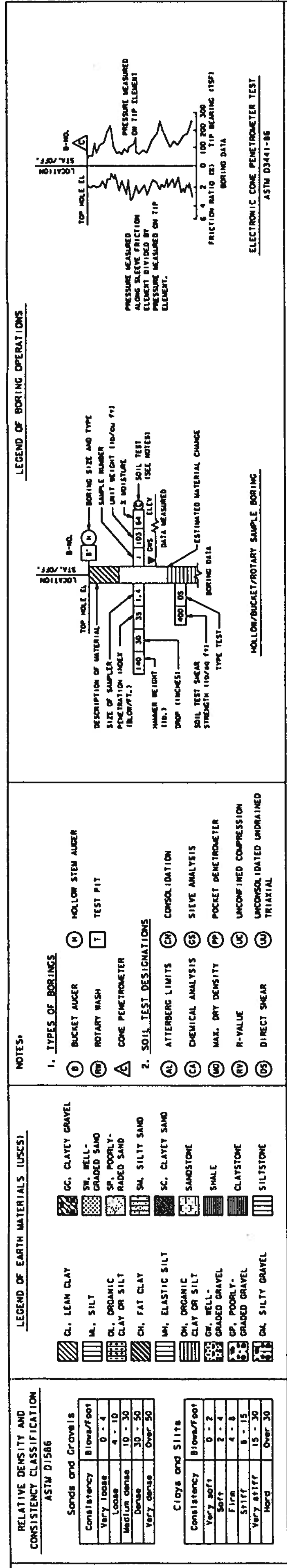




PROFILE

HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'

STATIONING ("WS" LINE) 5930 5935 5940



Sands and Gravels Consistency	Blows/Foot
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	Over 50

Clays and Silts Consistency	Blows/Foot
Very soft	0 - 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very stiff	15 - 30
Hard	Over 30

CALTRANS DESIGN OVERSIGHT

DRAWN BY J. CRAWLEY
CHECKED BY S. JAGANNATH

CH2M HILL
FIELD INVESTIGATOR
DATE 4/4/95

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-794F
POST MILE 39-02

WS CONNECTOR OVERCROSSING

LOG OF TEST BORINGS 2-9

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 6/12 11/1

SHEET 2 OF 10

NOTE:

BENCHMARK: 3R 61A 80, MSL ELEV. 406.173. ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY CH2M HILL)

LEGEND OF BORING OPERATIONS

ELECTRONIC CONE PENETROMETER TEST ASTM D3441-86

HOLLOW/BUCKET/ROTARY SAMPLE BORING

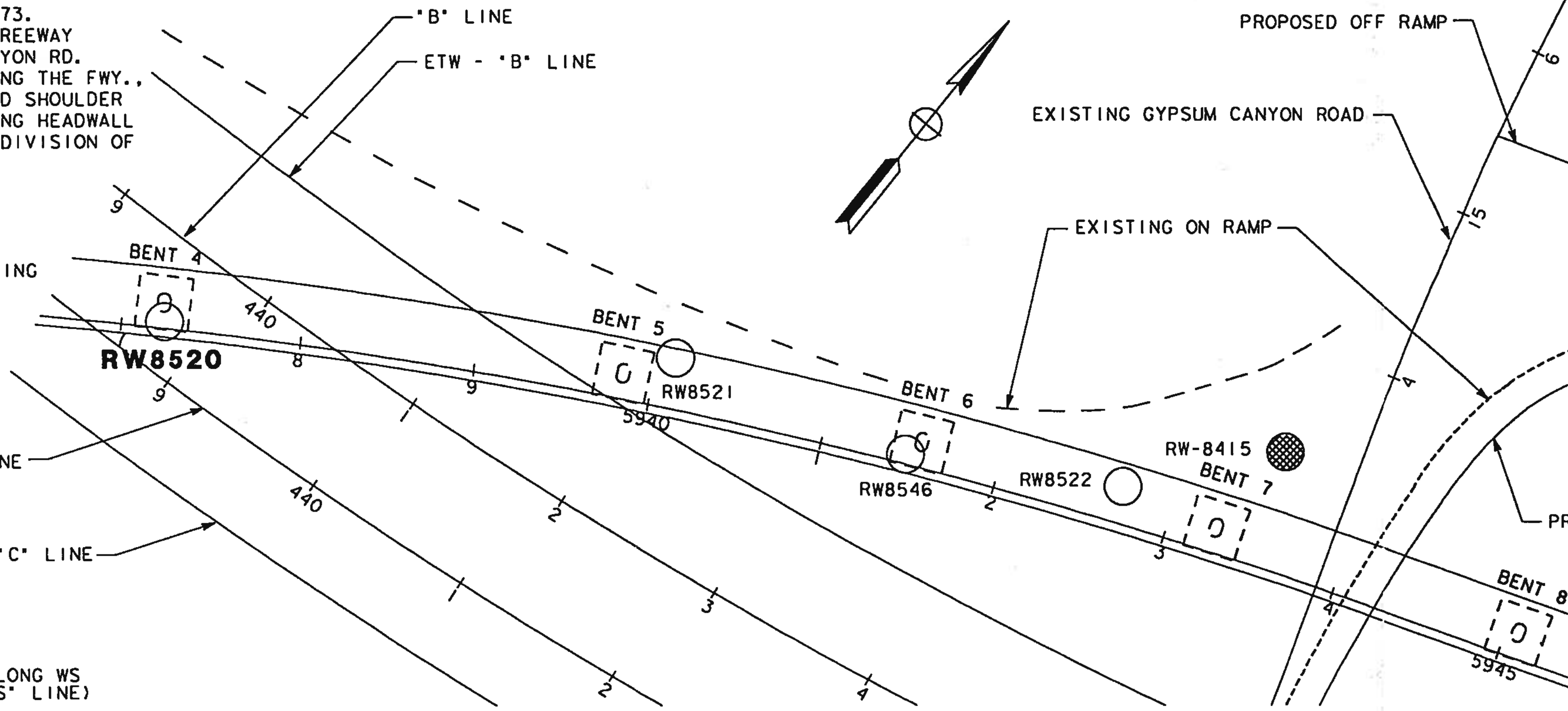
NOTES:
1. TYPES OF BORINGS: BUCKET AUGER; HOLLOW STEM AUGER; ROTARY WASH; TEST PIT; CONE PENETROMETER
2. SOIL TEST DESIGNATIONS: ATTERBERG LIMITS; CONSOLIDATION; CHEMICAL ANALYSIS; SIEVE ANALYSIS; MAX. DRY DENSITY; POCKET PENETROMETER; R-VALUE; UNCONFINED COMPRESSION; DIRECT SHEAR; UNCONSOLIDATED UNDRAINED TRIAXIAL

LEGEND OF EARTH MATERIALS (USCS): CL, LEAN CLAY; ML, SILT; OL, ORGANIC CLAY OR SILT; CH, FAT CLAY; MH, ELASTIC SILT; OH, ORGANIC CLAY OR SILT; GW, WELL-GRADED GRAVEL; GP, POORLY-GRADED GRAVEL; GM, SILTY GRAVEL; GC, CLAYEY GRAVEL; SW, WELL-GRADED SAND; SP, POORLY-GRADED SAND; SM, SILTY SAND; SC, CLAYEY SAND; SANDSTONE; SHALE; CLAYSTONE; SILTSTONE

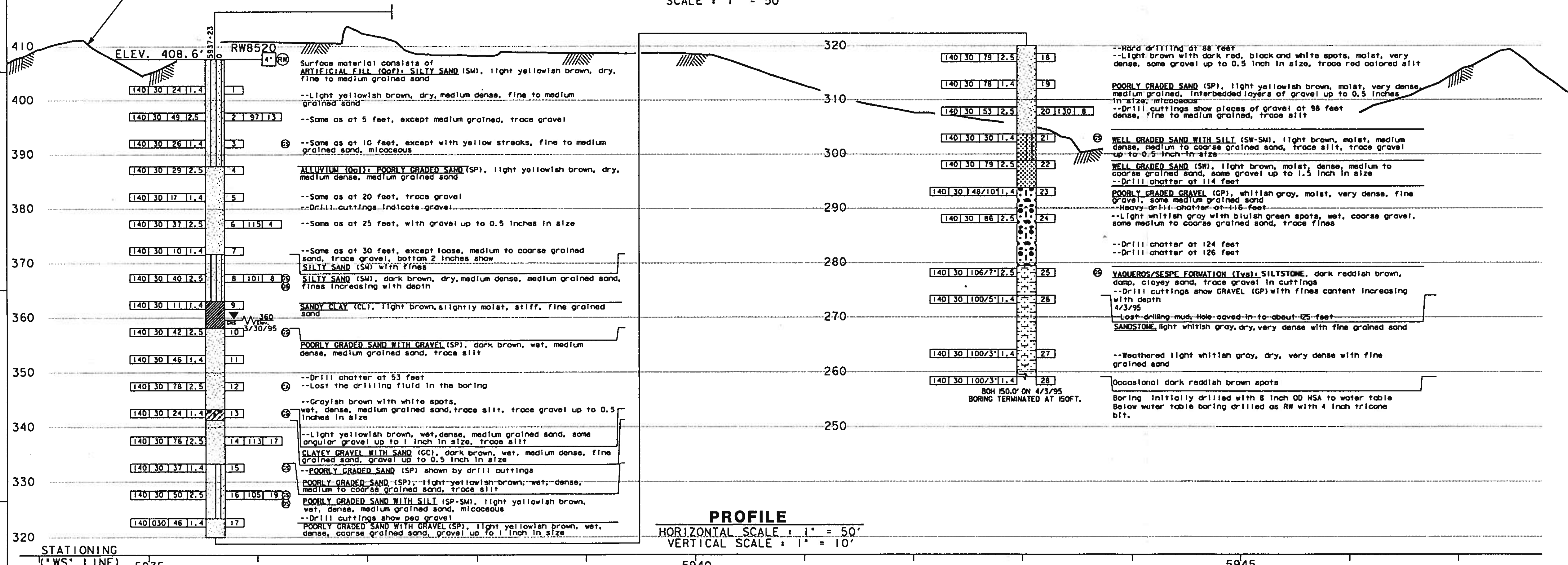
RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION ASTM D1586

Sands and Gravels Consistency	Blows/Foot
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	Over 50

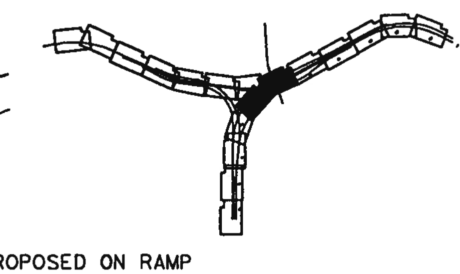
Clays and Silts Consistency	Blows/Foot
Very soft	0 - 2
Soft	2 - 4
Medium	4 - 8
Stiff	8 - 15
Very stiff	15 - 30
Hard	Over 30



PLAN
SCALE : 1" = 50'



PROFILE
HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER LAWRENCE H. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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CALTRANS DESIGN OVERSIGHT

DRAWN BY J. CRAWLEY
CHECKED BY S. JAGANNATH

CH2M HILL
FIELD INVESTIGATOR
DATE 3/30/95

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-794F
POST MILE 39-02

WS CONNECTOR OVERCROSSING
LOG OF TEST BORINGS 2-11

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 6/12 11/1

SHEET 3 OF 10

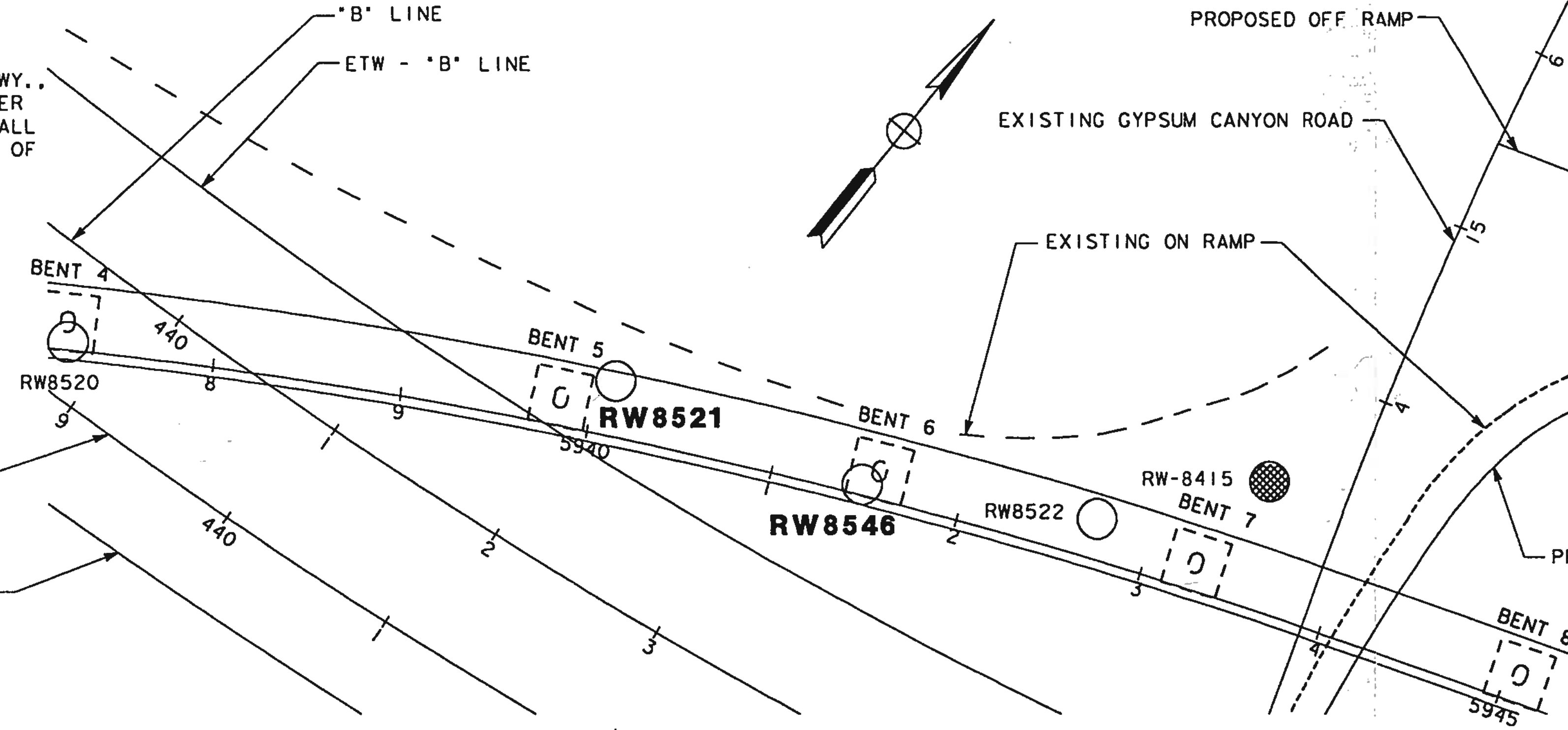
NOTE:

BENCHMARK: 3R 61A 80, MSL ELEV. 406.173. ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

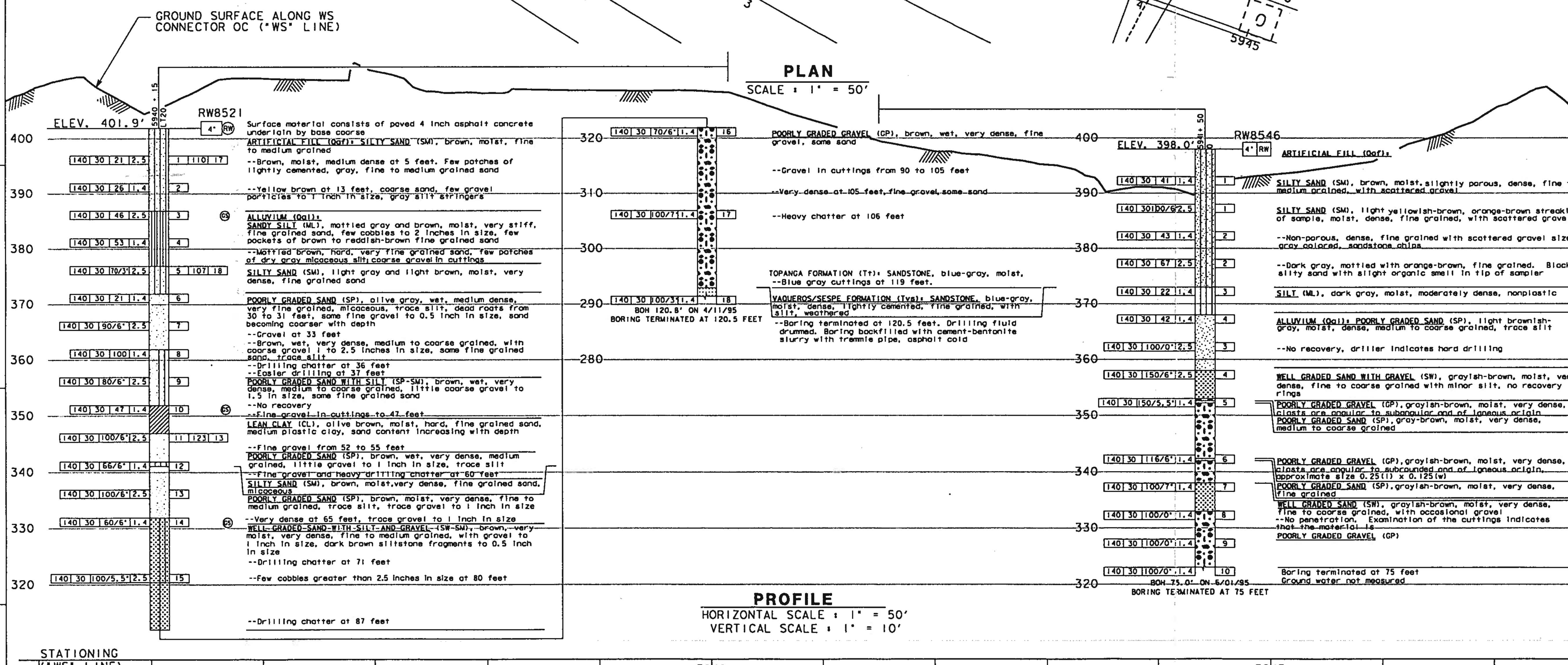
LEGEND

HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY CH2M HILL)



PLAN
SCALE : 1" = 50'



RW8521

Surface material consists of paved 4 inch asphalt concrete underlain by base coarse

ARTIFICIAL FILL (Qaf): SILTY SAND (SM), brown, moist, fine to medium grained

--Brown, moist, medium dense at 5 feet. Few patches of lightly cemented, gray, fine to medium grained sand

--Yellow brown at 13 feet, coarse sand, few gravel particles to 1 inch in size, gray silt stringers

ALLUVIUM (Qal):
SANDY SILT (ML), mottled gray and brown, moist, very stiff, fine grained sand, few cobbles to 2 inches in size, few pockets of brown to reddish-brown fine grained sand

--Mottled brown, hard, very fine grained sand, few patches of dry gray micaceous silt; coarse gravel in cuttings

SILTY SAND (SM), light gray and light brown, moist, very dense, fine grained sand

POORLY GRADED SAND (SP), olive gray, wet, medium dense, very fine grained, micaceous, trace silt, dead roots from 30 to 31 feet, some fine gravel to 0.5 inch in size, sand becoming coarser with depth

--Gravel at 33 feet

--Brown, wet, very dense, medium to coarse grained, with coarse gravel 1 to 2.5 inches in size, some fine grained sand, trace silt

--Drilling chatter at 36 feet

--Easier drilling at 37 feet

POORLY GRADED SAND WITH SILT (SP-SM), brown, wet, very dense, medium to coarse grained, little coarse gravel to 1.5 in size, some fine grained sand

--No recovery

--Fine gravel in cuttings to 47 feet

LEAN CLAY (CL), olive brown, moist, hard, fine grained sand, medium plastic clay, sand content increasing with depth

--Fine gravel from 52 to 55 feet

POORLY GRADED SAND (SP), brown, wet, very dense, medium grained, little gravel to 1 inch in size, trace silt

--Fine gravel and heavy drilling chatter at 60 feet

SILTY SAND (SM), brown, moist, very dense, fine grained sand, micaceous

POORLY GRADED SAND (SP), brown, moist, very dense, fine to medium grained, trace silt, trace gravel to 1 inch in size

--Very dense at 65 feet, trace gravel to 1 inch in size

WELL-GRADED-SAND-WITH-SILT-AND-GRAVEL (SW-SM), brown, very moist, very dense, fine to medium grained, with gravel to 1 inch in size, dark brown siltstone fragments to 0.5 inch in size

--Drilling chatter at 71 feet

--Few cobbles greater than 2.5 inches in size at 80 feet

--Drilling chatter at 87 feet

POORLY GRADED GRAVEL (GP), brown, wet, very dense, fine gravel, some sand

--Gravel in cuttings from 90 to 105 feet

--Very dense at 105 feet, fine gravel, some sand

--Heavy chatter at 106 feet

TOPANGA FORMATION (Tt): SANDSTONE, blue-gray, moist,
--Blue gray cuttings at 119 feet.

VAQUEROS/SESPE FORMATION (Tvs): SANDSTONE, blue-gray, moist, dense, lightly cemented, fine grained, with silt, weathered

--Boring terminated at 120.5 feet. Drilling fluid drummed. Boring backfilled with cement-bentonite slurry with tremmie pipe, asphalt cold

RW8546

ARTIFICIAL FILL (Qaf):

SILTY SAND (SM), brown, moist, slightly porous, dense, fine to medium grained, with scattered gravel

SILTY SAND (SM), light yellowish-brown, orange-brown streaking of sample, moist, dense, fine grained, with scattered gravel

--Non-porous, dense, fine grained with scattered gravel sizes, gray colored, sandstone chips

--Dark gray, mottled with orange-brown, fine grained. Black silty sand with slight organic smell in tip of sampler

SILT (ML), dark gray, moist, moderately dense, nonplastic

ALLUVIUM (Qal): POORLY GRADED SAND (SP), light brownish-gray, moist, dense, medium to coarse grained, trace silt

--No recovery, driller indicates hard drilling

WELL GRADED SAND WITH GRAVEL (SW), grayish-brown, moist, very dense, fine to coarse grained with minor silt, no recovery in rings

POORLY GRADED GRAVEL (GP), grayish-brown, moist, very dense, clasts are angular to subangular and of igneous origin

POORLY GRADED SAND (SP), gray-brown, moist, very dense, medium to coarse grained

POORLY GRADED GRAVEL (GP), grayish-brown, moist, very dense, clasts are angular to subrounded and of igneous origin, approximate size 0.25(l) x 0.125(w)

POORLY GRADED SAND (SP), grayish-brown, moist, very dense, fine grained

WELL GRADED SAND (SW), grayish-brown, moist, very dense, fine to coarse grained, with occasional gravel

--No penetration. Examination of the cuttings indicates that the material is

POORLY GRADED GRAVEL (GP)

Boring terminated at 75 feet
Ground water not measured

PROFILE
HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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LEGEND OF BORING OPERATIONS

ELECTRONIC CONE PENETROMETER TEST ASTM D3441-86

HOLLOW/BUCKET/ROTARY SAMPLE BORING

NOTES: 1. TYPES OF BORINGS: BUCKET AUGER; ROTARY WASH; CONE PENETROMETER; HOLLOW STEM AUGER; TEST PIT
2. SOIL TEST DESIGNATIONS: ATTERBERG LIMITS; CHEMICAL ANALYSIS; MAX. DRY DENSITY; R-VALUE; DIRECT SHEAR; CONSOLIDATION; SIEVE ANALYSIS; POCKET PENETROMETER; UNCONFINED COMPRESSION; UNCONSOLIDATED UNDRAINED TRIAXIAL

LEGEND OF EARTH MATERIALS (USCS): CL, LEAN CLAY; ML, SILT; OL, ORGANIC CLAY OR SILT; CH, FAT CLAY; MH, ELASTIC SILT; OH, ORGANIC CLAY OR SILT; GW, WELL-GRADED GRAVEL; GP, POORLY-GRADED GRAVEL; GM, SILTY GRAVEL; GC, CLAYEY GRAVEL; SW, WELL-GRADED SAND; SP, POORLY-GRADED SAND; SM, SILTY SAND; SC, CLAYEY SAND; SANDSTONE; SHALE; CLAYSTONE; SILTSTONE

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION ASTM D1586

Sands and Gravels: Consistency	Blows/Foot
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	Over 50

Clays and Silts: Consistency	Blows/Foot
Very soft	0 - 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very stiff	15 - 30
Hard	Over 30

CALTRANS DESIGN OVERSIGHT	DRAWN BY: J. CRAWLEY	CH2M HILL, FIELD INVESTIGATOR	TRANSPORTATION CORRIDOR AGENCIES	MICHAEL ENDRES, TCA PROJECT MANAGER
	CHECKED BY: S. JAGANNATH	DATE 6/1/95		

BRIDGE NO. 55-794F
POST MILE 39.02

WS CONNECTOR OVERCROSSING
LOG OF TEST BORINGS 2-13

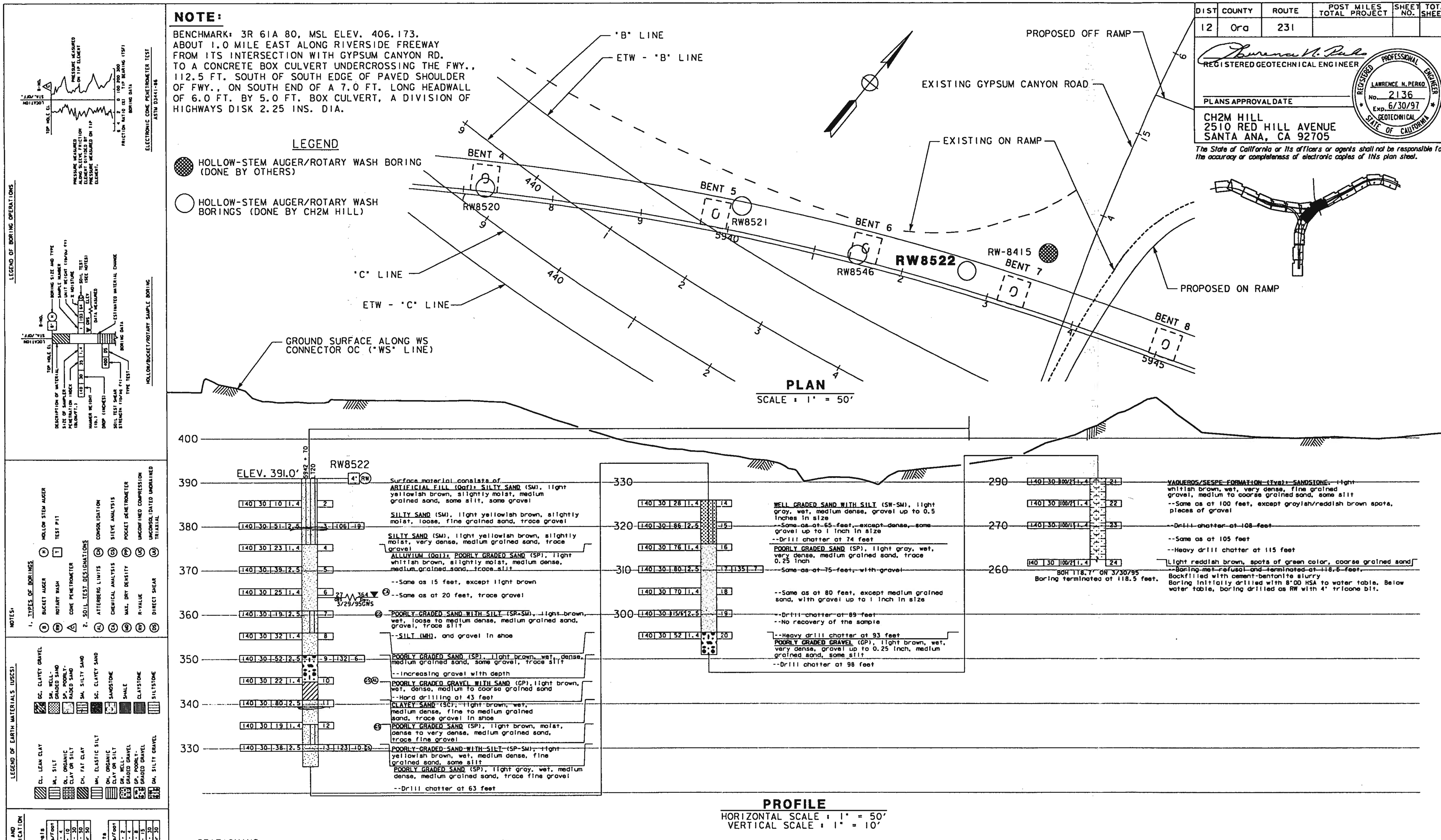
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY): 6/12 11/1

SHEET 4 OF 10



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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CALTRANS DESIGN OVERSIGHT

DRAWN BY J. CRAWLEY
CHECKED BY S. JAGANNATH

CH2M HILL
FIELD INVESTIGATOR
DATE 3/29/95

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-794F
POST MILE 39.02

WS CONNECTION OVERCROSSING
LOG OF TEST BORINGS 2-15

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 6/12 11/1

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 5 OF 10

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

REGISTERED PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

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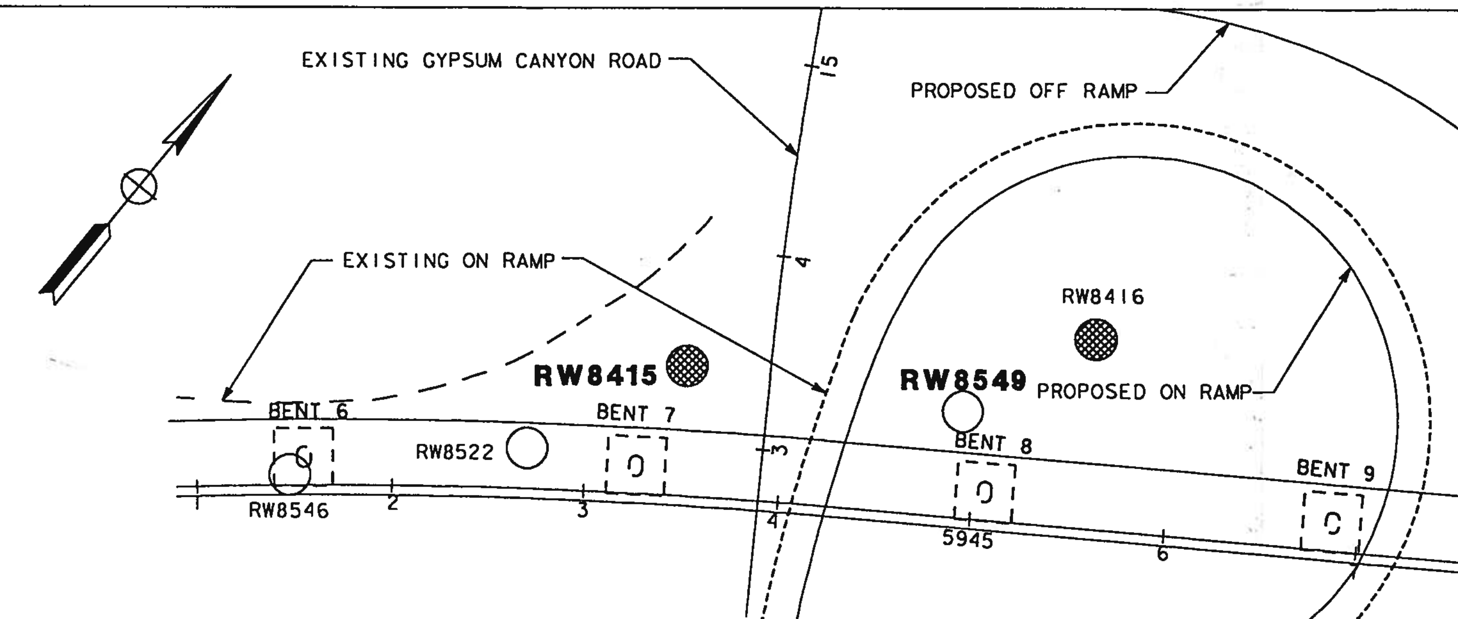
THE DATA INCLUDED ON THIS LOG OF TEST BORINGS HAS BEEN EXTRACTED FROM THE GEOTECHNICAL/MATERIALS REPORT FOR TCA CONTRACT NO. E94-01. THIS REPORT WAS ISSUED BY KLEINFELDER, INC. ON MARCH 17, 1994. CH2M HILL HAS UNDERTAKEN A REVIEW OF THE REFERENCED INFORMATION AND CONSIDERS IT APPROPRIATE FOR THE DESIGN OF WS OVERCROSSING NO. (S) 55-794F. HOWEVER CH2M HILL DOES NOT GUARANTEE THE ACCURACY AND COMPLETENESS OF THE ORIGINAL BORING DATA.

NOTE:

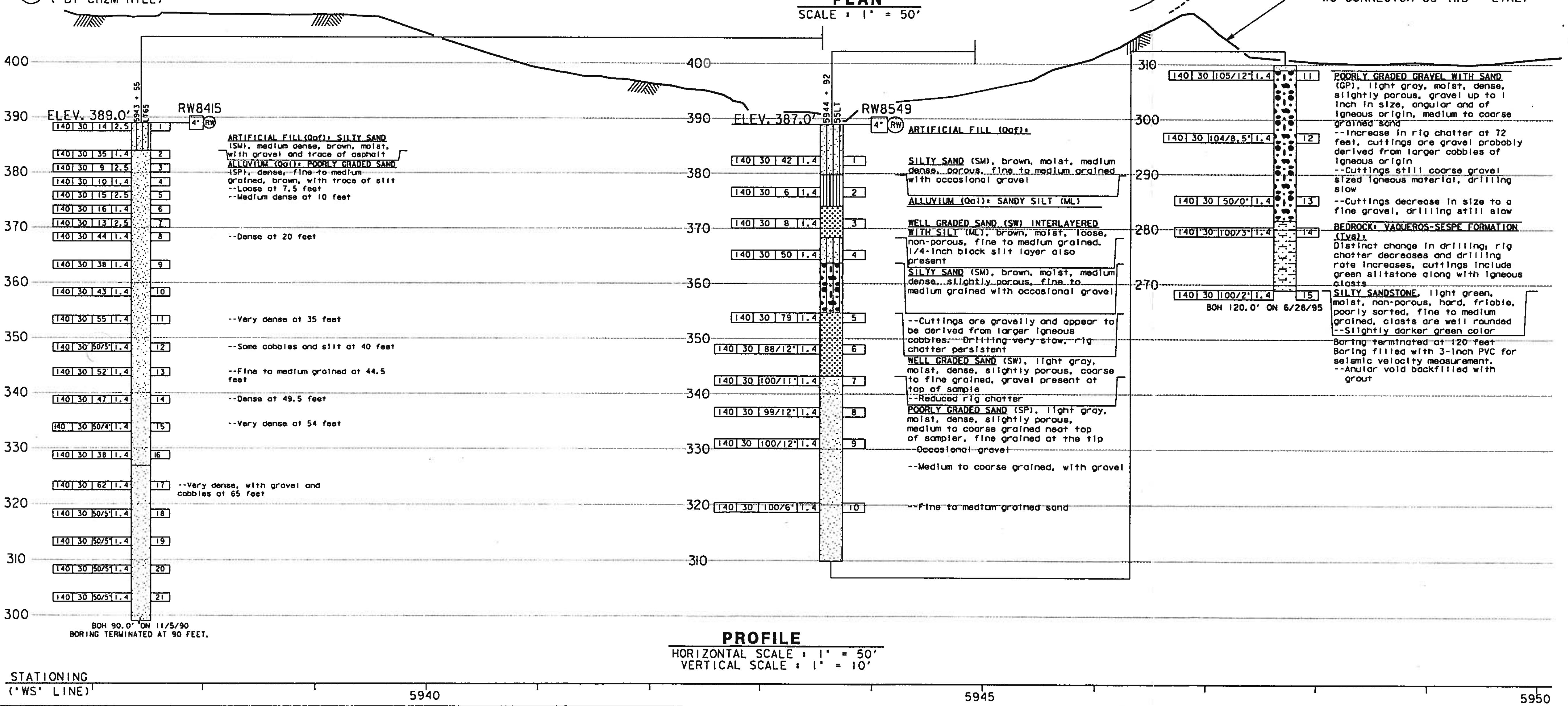
BENCHMARK: 3R 61A 80, MSL ELEV. 406.173. ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

- HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)
- HOLLOW-STEM AUGER/ROTARY WASH BORINGS (BY CH2M HILL)



PLAN
SCALE : 1" = 50'



PROFILE
HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'

DRAWN BY	J. CRAWLEY	KLEINFELDER FIELD INVESTIGATOR DATE 11/1/90-11/5/90	TRANSPORTATION CORRIDOR AGENCIES	MICHAEL ENDRES TCA PROJECT MANAGER	BRIDGE NO. 55-749F POST MILE 39.02
CHECKED BY	S. JAGANNATH				

CALTRANS DESIGN OVERSIGHT

WS CONNECTION OVERCROSSING
LOG OF TEST BORINGS 2-17

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES —— 6/12 11/1

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 6 OF 10

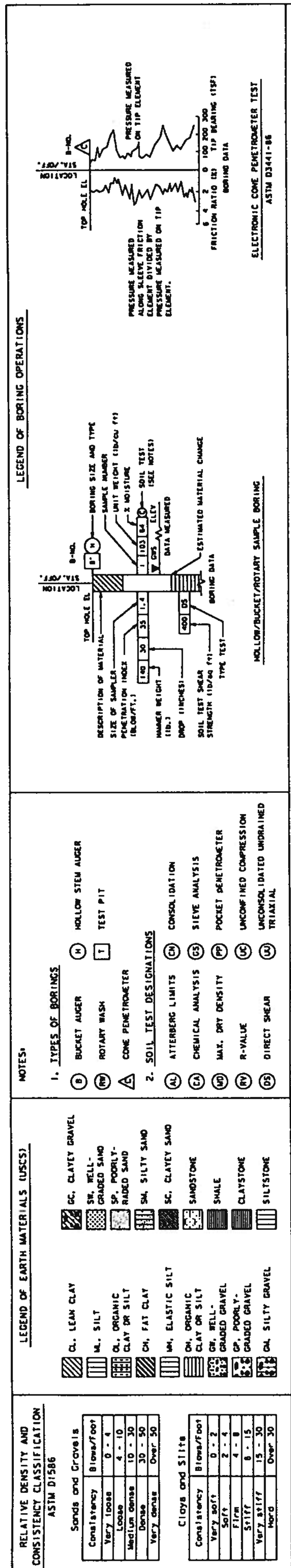
THE DATA INCLUDED ON THIS LOG OF TEST BORINGS HAS BEEN EXTRACTED FROM THE GEOTECHNICAL/MATERIALS REPORT FOR TCA CONTRACT NO. E94-01. THIS REPORT WAS ISSUED BY KLEINFELDER, INC. ON MARCH 17, 1994. CH2M HILL HAS UNDERTAKEN A REVIEW OF THE REFERENCED INFORMATION AND CONSIDERS IT APPROPRIATE FOR THE DESIGN OF WS OVERCROSSING NO. (S) 55-794F. HOWEVER CH2M HILL DOES NOT GUARANTEE THE ACCURACY AND COMPLETENESS OF THE ORIGINAL BORING DATA.

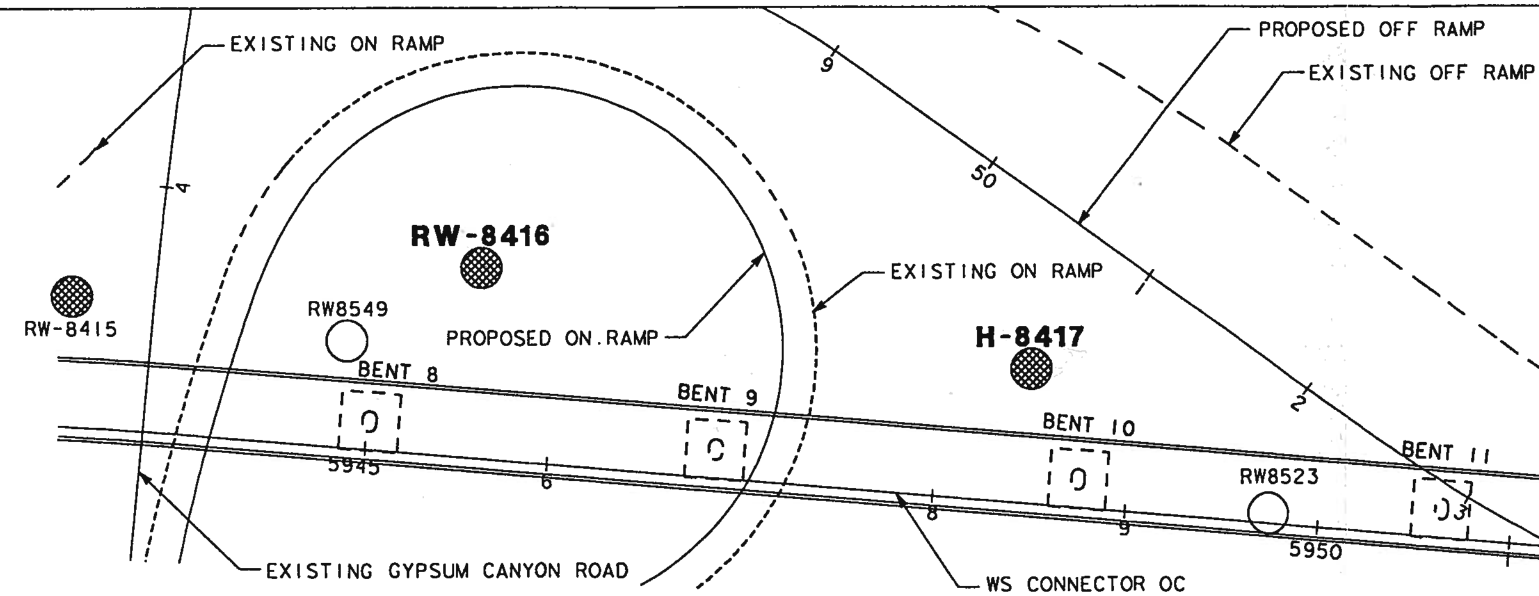
NOTE:

BENCHMARK: 3R 61A 80, MSL ELEV. 406.173. ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

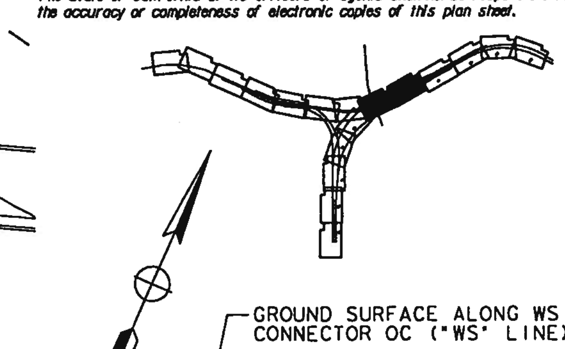
- HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)
- HOLLOW-STEM AUGER/ROTARY WASH BORINGS (BY CH2M HILL)

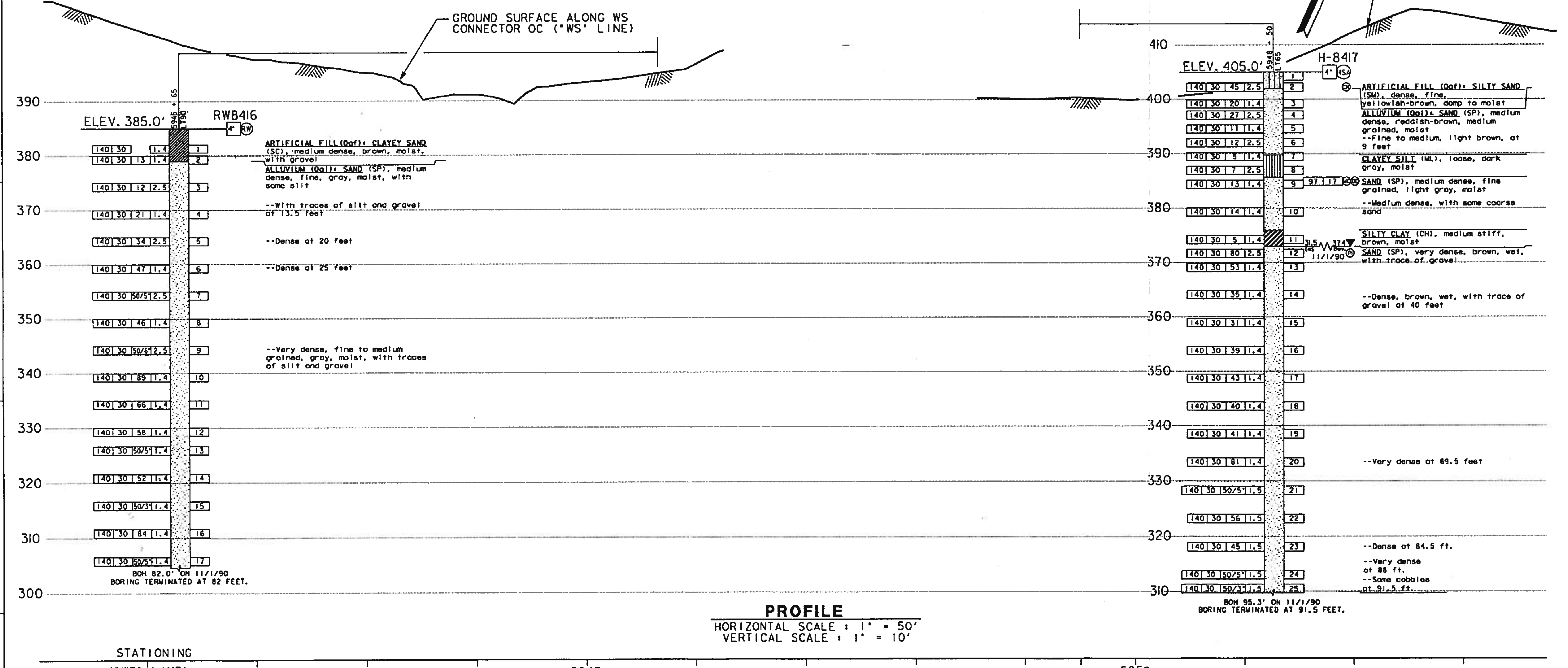




PLAN

SCALE : 1" = 50'





PROFILE

HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

PROFESSIONAL ENGINEER — REGISTERED — LAWRENCE N. PERKO — No. 2136 — Exp. 6/30/97 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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CALTRANS DESIGN OVERSIGHT	DRAWN BY	J. CRAWLEY	CH2M HILL & KLEINFELDER	TRANSPORTATION CORRIDOR AGENCIES	MICHAEL ENDRES
	CHECKED BY	S. JAGANNATH	FIELD INVESTIGATOR DATE 4/4/95		TCA PROJECT MANAGER

BRIDGE NO. 55-794F
POST MILE 39.02

WS CONNECTOR OVERCROSSING
LOG OF TEST BORINGS 2-19

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)		SHEET	OF
7/26	11/1	7	10

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — LAWRENCE H. PERKO — No. 2136 — Exp. 6/30/97 — GEOTECHNICAL — STATE OF CALIFORNIA

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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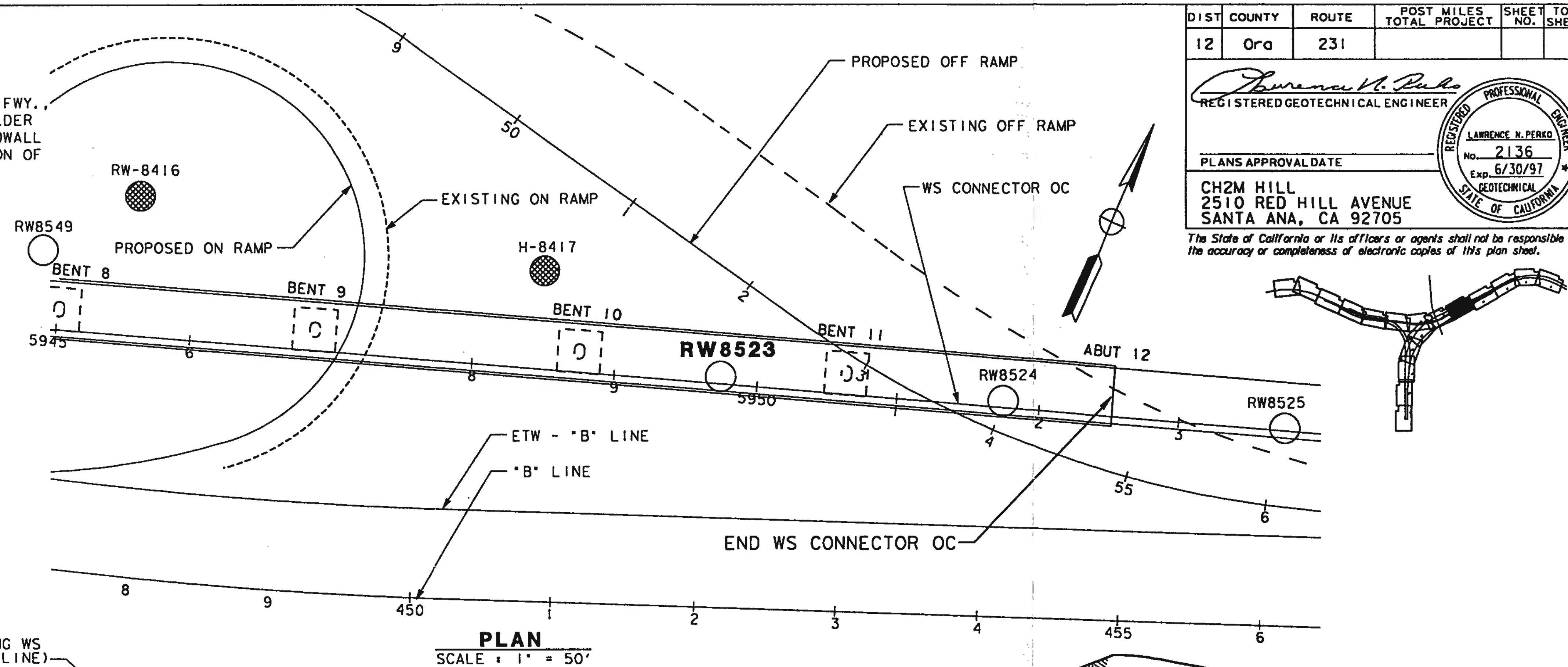
NOTE:

BENCHMARK: 3R 61A 80, MSL ELEV. 406.173.
ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

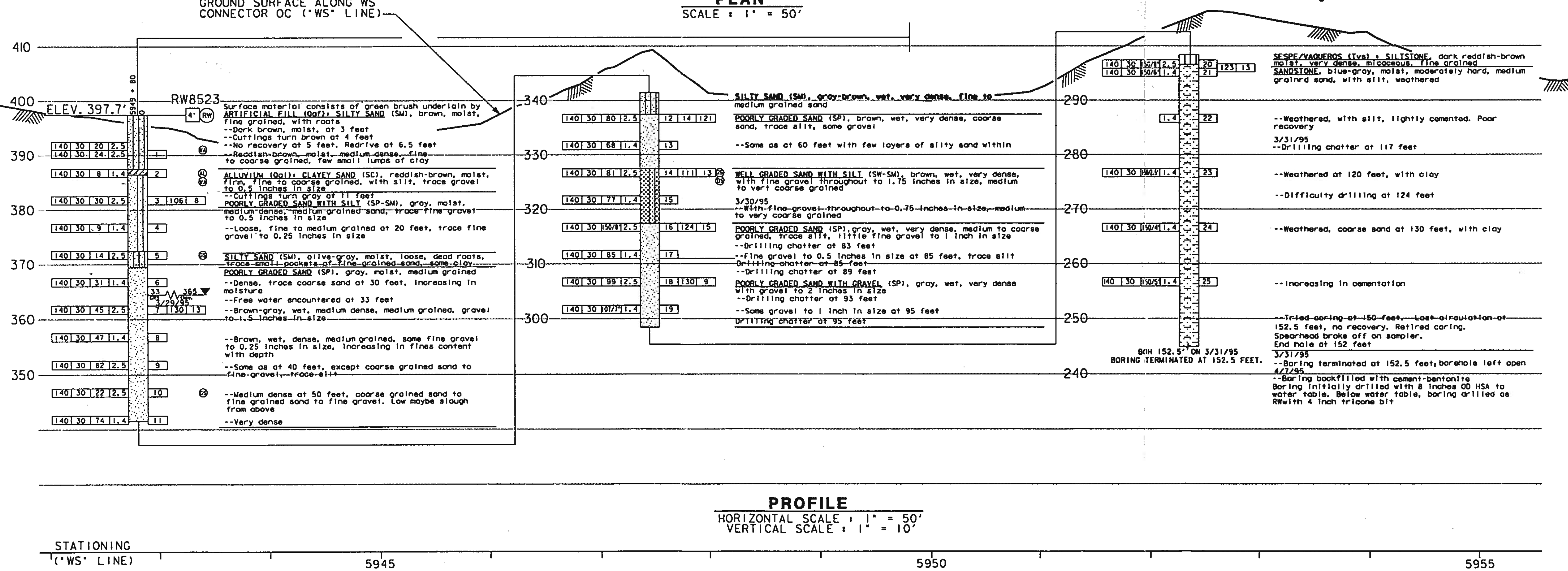
HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY CH2M HILL)



PLAN

SCALE : 1" = 50'



RW8523

Surface material consists of green brush underlain by **ARTIFICIAL FILL (Qaf): SILTY SAND** (SM), brown, moist, fine grained, with roots
--Dark brown, moist, at 3 feet
--Cuttings turn brown at 4 feet
--No recovery at 5 feet. Redrive at 6.5 feet
--~~Reddish-brown, moist, medium dense, fine~~ to coarse grained, few small lumps of clay

ALLUVIUM (Qal): CLAYEY SAND (SC), reddish-brown, moist, firm, fine to coarse grained, with silt, trace gravel to 0.5 inches in size
--Cuttings turn gray at 11 feet
POORLY GRADED SAND WITH SILT (SP-SM), gray, moist, medium dense, medium grained sand, trace fine gravel to 0.5 inches in size
--Loose, fine to medium grained at 20 feet, trace fine gravel to 0.25 inches in size

SILTY SAND (SM), olive-gray, moist, loose, dead roots, trace small pockets of fine grained sand, some clay
POORLY GRADED SAND (SP), gray, moist, medium grained
--Dense, trace coarse sand at 30 feet, increasing in moisture
--Free water encountered at 33 feet
--Brown-gray, wet, medium dense, medium grained, gravel to 1.5 inches in size
--Brown, wet, dense, medium grained, some fine gravel to 0.25 inches in size, increasing in fines content with depth
--Same as at 40 feet, except coarse grained sand to fine gravel, trace silt
--Medium dense at 50 feet, coarse grained sand to fine grained sand to fine gravel. Low maybe slough from above
--Very dense

SILTY SAND (SM), gray-brown, wet, very dense, fine to medium grained sand
POORLY GRADED SAND (SP), brown, wet, very dense, coarse sand, trace silt, some gravel
--Same as at 60 feet with few layers of silty sand within

WELL GRADED SAND WITH SILT (SW-SM), brown, wet, very dense, with fine gravel throughout to 1.75 inches in size, medium to vert coarse grained
3/30/95
--~~With fine gravel throughout to 0.75 inches in size, medium~~ to very coarse grained
POORLY GRADED SAND (SP), gray, wet, very dense, medium to coarse grained, trace silt, little fine gravel to 1 inch in size
--Drilling chatter at 83 feet
--Fine gravel to 0.5 inches in size at 85 feet, trace silt
~~Drilling chatter at 85 feet~~
--Drilling chatter at 89 feet
POORLY GRADED SAND WITH GRAVEL (SP), gray, wet, very dense with gravel to 2 inches in size
--Drilling chatter at 93 feet
--Some gravel to 1 inch in size at 95 feet
Drilling chatter at 95 feet

SESPE/VAQUEROS (Tvs) : SILTSTONE, dark reddish-brown moist, very dense, micaceous, fine grained
SANDSTONE, blue-gray, moist, moderately hard, medium grainrd sand, with silt, weathered
--Weathered, with silt, lightly cemented. Poor recovery
3/31/95
--Drilling chatter at 117 feet
--Weathered at 120 feet, with clay
--Difficulty drilling at 124 feet
--Weathered, coarse sand at 130 feet, with clay
--Increasing in cementation
--~~Tried coring at 150 feet. Lost circulation at~~ 152.5 feet, no recovery. Retired coring.
Spearhead broke off on sampler.
End hole at 152 feet
3/31/95
--Boring terminated at 152.5 feet; borehole left open
4/7/95
--Boring backfilled with cement-bentonite
Boring initially drilled with 8 inches OD HSA to water table. Below water table, boring drilled as RWwith 4 inch tricone bit

PROFILE

HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'

LEGEND OF BORING OPERATIONS

ELECTRONIC CONE PENETROMETER TEST ASTM D3441-86

HOLLOW/BUCKET/ROTARY SAMPLE BORING

NOTES:
1. TYPES OF BORINGS: BUCKET AUGER, HOLLOW STEM AUGER, ROTARY WASH, TEST PIT, CONE PENETROMETER
2. SOIL TEST DESIGNATIONS: ATTERBERG LIMITS, CONSOLIDATION, CHEMICAL ANALYSIS, SIEVE ANALYSIS, MAX. DRY DENSITY, POCKET PENETROMETER, R-VALUE, UNCONFINED COMPRESSION, DIRECT SHEAR, UNCONSOLIDATED UNDRAINED TRIAXIAL

LEGEND OF EARTH MATERIALS (USCS)

CL LEAN CLAY; ML SILT; OL ORGANIC CLAY OR SILT; CH FAT CLAY; MH ELASTIC SILT; OH ORGANIC CLAY OR SILT; GW WELL-GRADED GRAVEL; GP POORLY-GRADED GRAVEL; GM SILTY GRAVEL; GC CLAYEY GRAVEL; SW WELL-GRADED SAND; SP POORLY-GRADED SAND; SM SILTY SAND; SC CLAYEY SAND; SANDSTONE; SHALE; CLAYSTONE; SILTSTONE

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION ASTM D1586

Sands and Gravels: Consistency	Blows/Foot
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	Over 50

Clays and Silts: Consistency	Blows/Foot
Very soft	0 - 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very stiff	15 - 30
Hard	Over 30

CALTRANS DESIGN OVERSIGHT	DRAWN BY: J. CRAWLEY	CH2M HILL — FIELD INVESTIGATOR	TRANSPORTATION CORRIDOR AGENCIES
	CHECKED BY: S. JAGANNATH	DATE 3/31/95	MICHAEL ENDRES — TCA PROJECT MANAGER

BRIDGE NO. 55-794F
POST MILE 39.02

WS CONNECTOR OVERCROSSING
LOG OF TEST BORINGS 2-21

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 6/12 11/1

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 8 OF 10

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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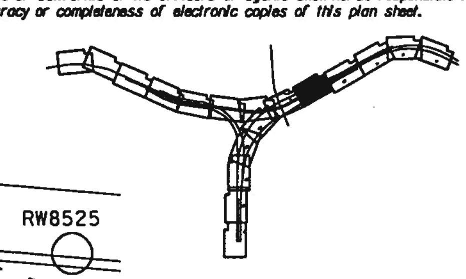
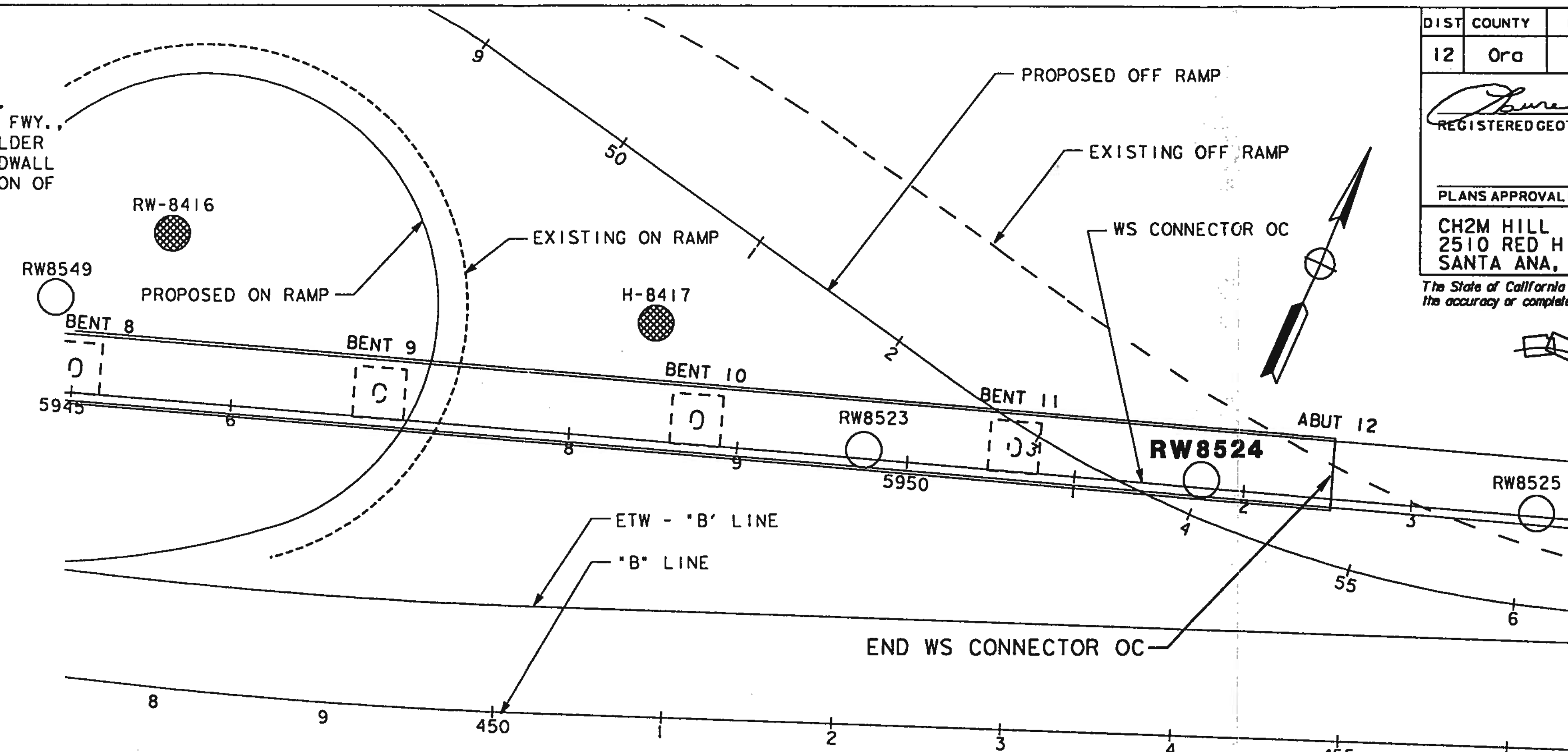


NOTE:

BENCHMARK: 3R 61A 80, MSL ELEV. 406.173. ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

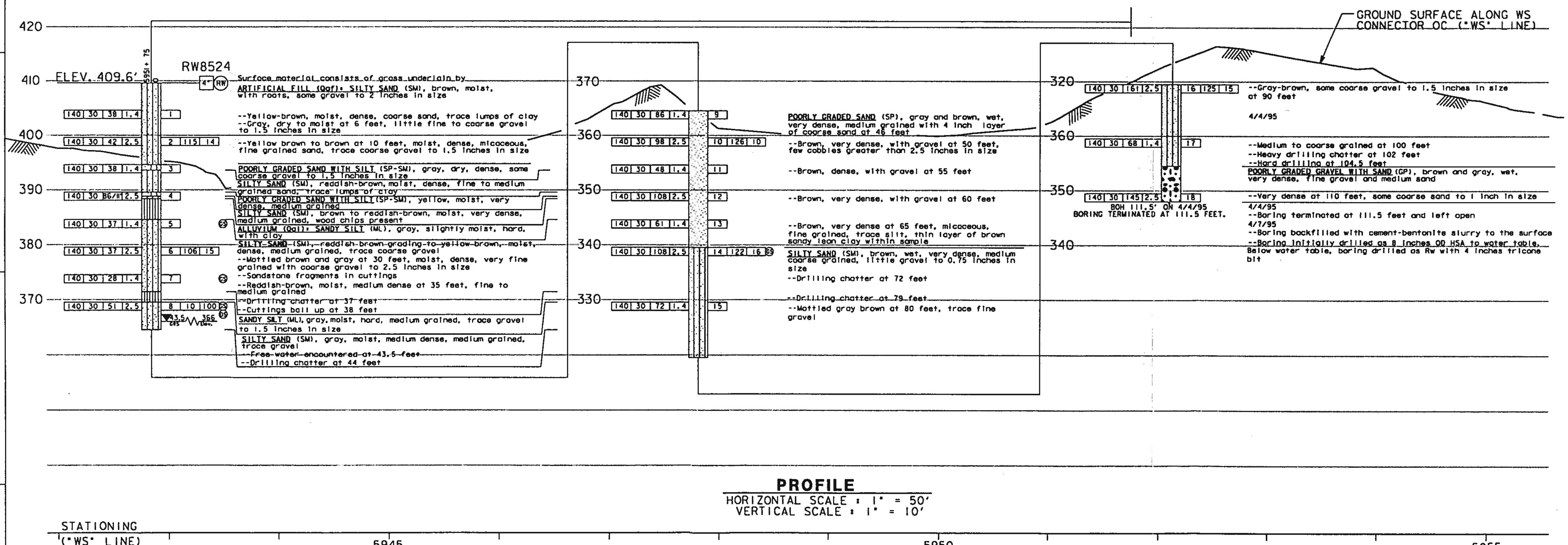
LEGEND

- HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)
- HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY CH2M HILL)



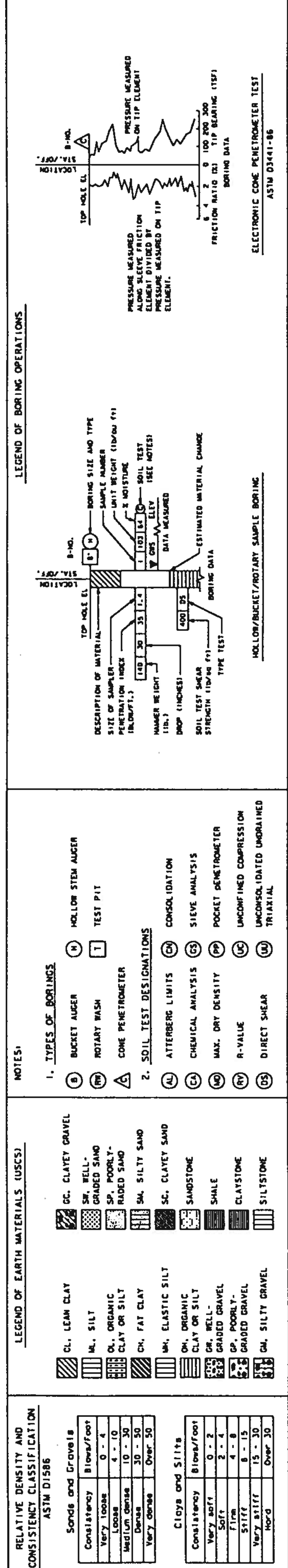
PLAN

SCALE : 1" = 50'



PROFILE

HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'



DRAWN BY	J. CRAWLEY	CH2M HILL FIELD INVESTIGATOR	TRANSPORTATION CORRIDOR AGENCIES	MICHAEL ENDRES TCA PROJECT MANAGER	BRIDGE NO. 55-794F	WS CONNECTOR OVERCROSSING
CHECKED BY	S. JAGANNATH	DATE 4/4/95			POST MILE 39.02	LOG OF TEST BORINGS 2-23

CALTRANS DESIGN OVERSIGHT

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 6/12 11/1

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 9 OF 10

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	231			

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER LAWRENCE H. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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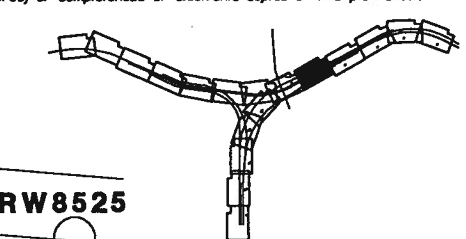


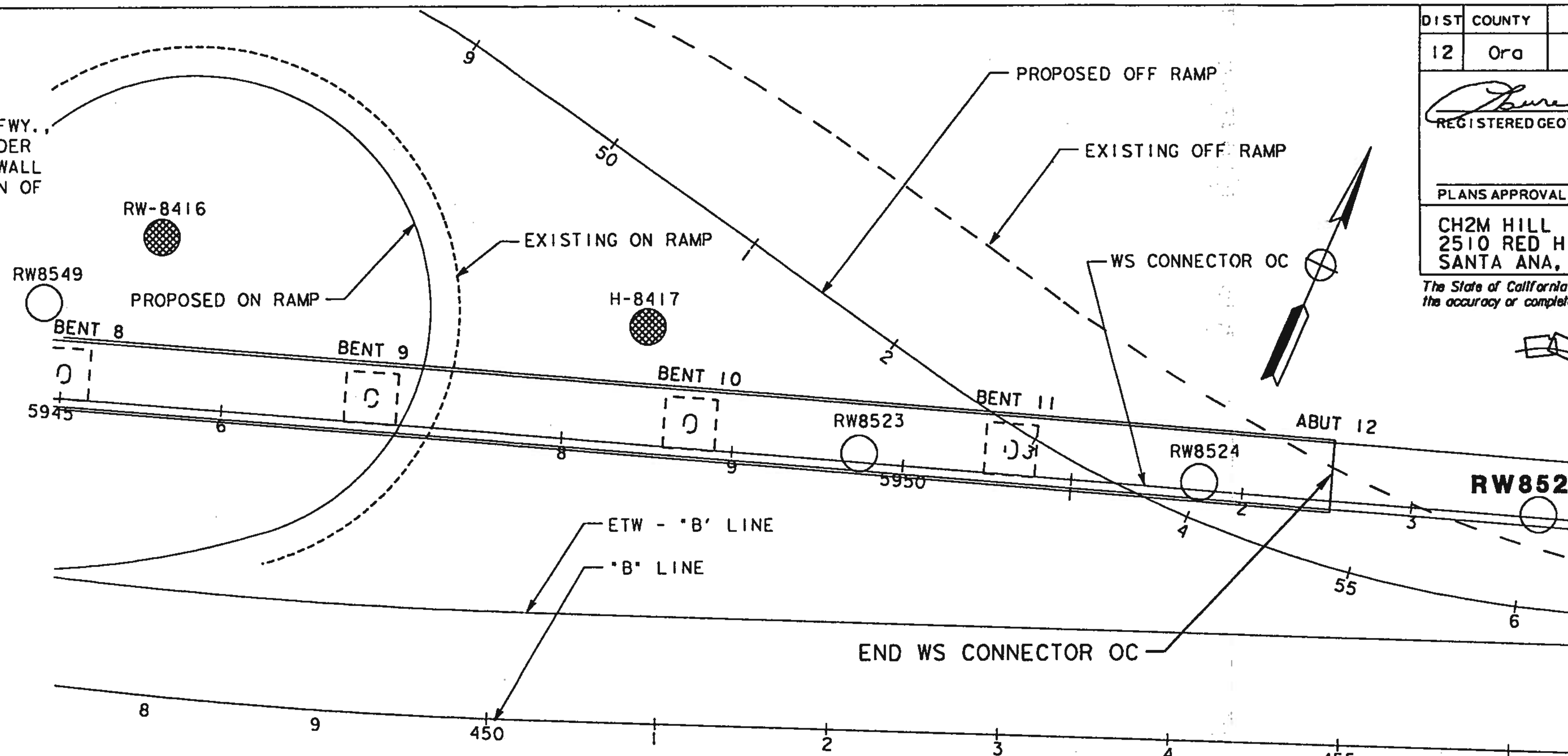
NOTE:

BENCHMARK: 3R 61A 80, MSL ELEV. 406.173. ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

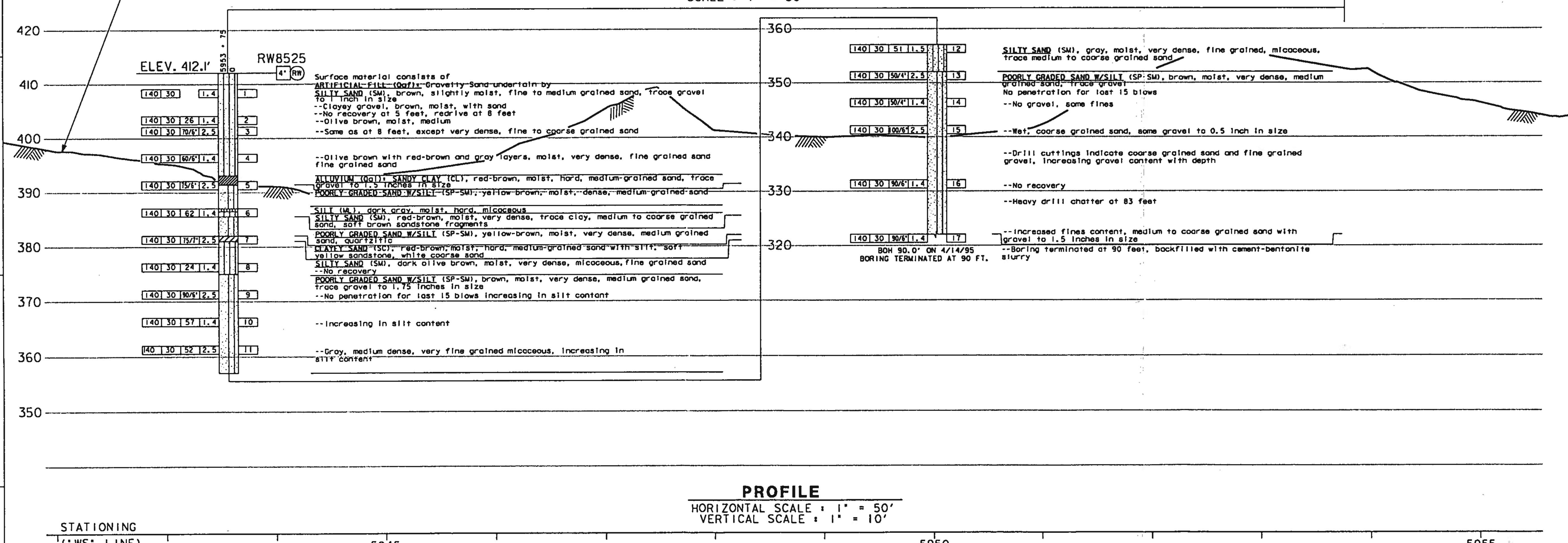
HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY CH2M HILL)



PLAN

SCALE : 1" = 50'



Hammer wt.	Drop	Penetration	Sampler size	Sample No.
140	30		1.4	1
140	30	26	1.4	2
140	30	70/6"	2.5	3
140	30	60/6"	1.4	4
140	30	15/6"	2.5	5
140	30	62	1.4	6
140	30	75/7"	2.5	7
140	30	24	1.4	8
140	30	90/6"	2.5	9
140	30	57	1.4	10
140	30	52	2.5	11
140	30	51	1.5	12
140	30	50/4"	2.5	13
140	30	50/4"	1.4	14
140	30	100/6"	2.5	15
140	30	90/6"	1.4	16
140	30	90/6"	1.4	17

PROFILE

HORIZONTAL SCALE : 1" = 50'
VERTICAL SCALE : 1" = 10'

LEGEND OF BORING OPERATIONS

ELECTRONIC CONE PENETROMETER TEST ASTM D3441-86

HOLLOW/BUCKET/ROTARY SAMPLE BORING

NOTES:

1. TYPES OF BORINGS: (B) BUCKET AUGER, (H) HOLLOW STEM AUGER, (RW) ROTARY WASH, TEST PIT, CONE PENETROMETER
2. SOIL TEST DESIGNATIONS: (AL) ATTERBERG LIMITS, (CN) CONSOLIDATION, (CA) CHEMICAL ANALYSIS, (SE) SIEVE ANALYSIS, (MD) MAX. DRY DENSITY, (PP) POCKET PENETROMETER, (RV) R-VALUE, (UC) UNCONFINED COMPRESSION, (DS) DIRECT SHEAR, (UU) UNCONSOLIDATED UNDRAINED TRIAXIAL

LEGEND OF EARTH MATERIALS (USCS): CL LEAN CLAY, ML SILT, OL ORGANIC CLAY OR SILT, CH FAT CLAY, MH ELASTIC SILT, OH ORGANIC CLAY OR SILT, GW WELL-GRADED GRAVEL, GP POORLY-GRADED GRAVEL, GM SILTY GRAVEL, GC CLAYEY GRAVEL, SW WELL-GRADED SAND, SP POORLY-GRADED SAND, SM SILTY SAND, SC CLAYEY SAND, SANDSTONE, SHALE, CLAYSTONE, SILTSTONE

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION ASTM D1586

Sands and Gravels: Consistency	Blows/Foot
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	Over 50

Clays and Silts: Consistency	Blows/Foot
Very soft	0 - 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very stiff	15 - 30
Hard	Over 30

CALTRANS DESIGN OVERSIGHT	DRAWN BY: J. CRAWLEY	CH2M HILL, FIELD INVESTIGATOR, DATE 4/14/95	TRANSPORTATION CORRIDOR AGENCIES
	CHECKED BY: S. JAGANNATH		

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-794F
POST MILE 39.02

WS CONNECTOR OVERCROSSING
LOG OF TEST BORINGS 2-25

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY): 6/12 11/1

SHEET 10 OF 10

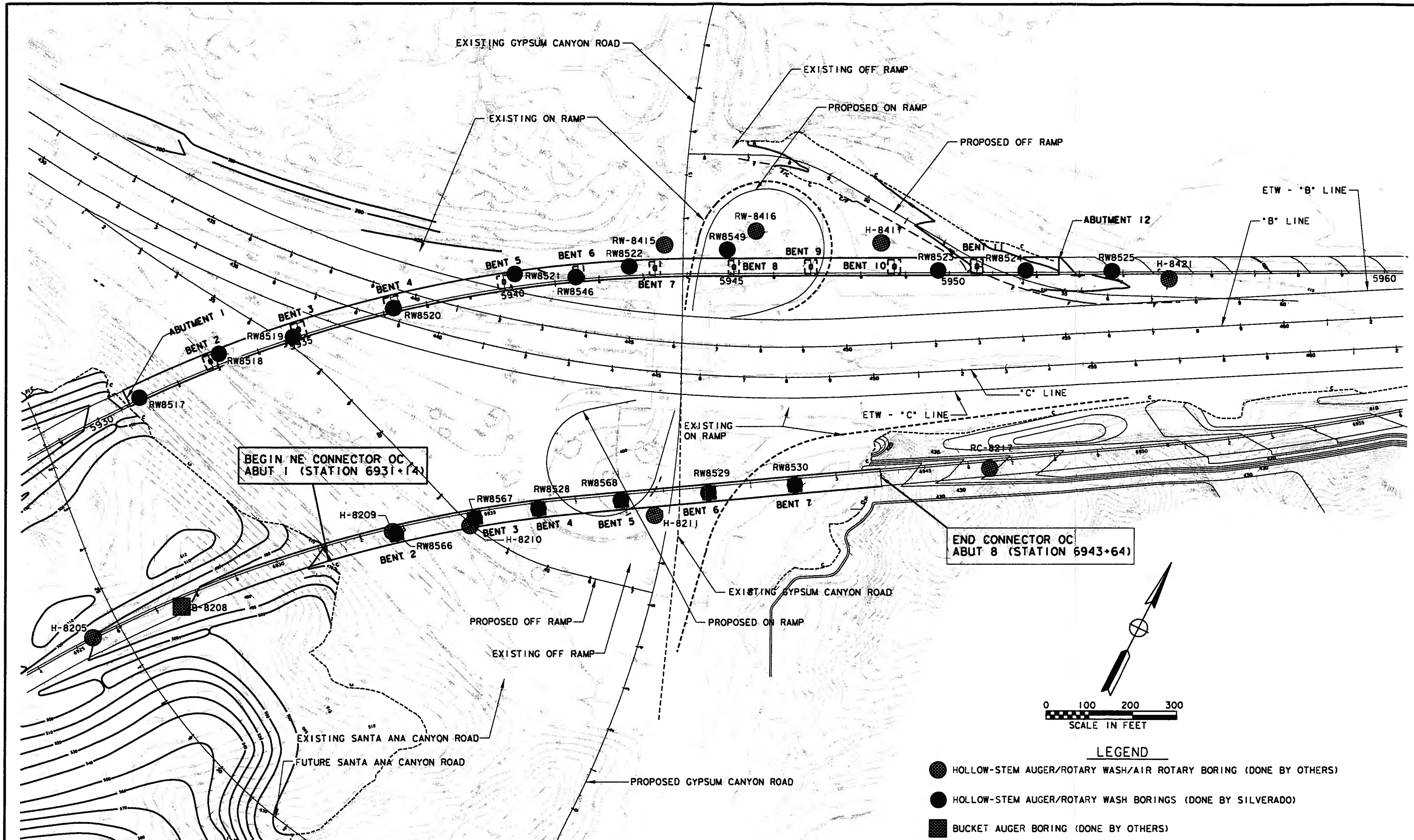


FIGURE 2-1
BORING LOCATION MAP
Foundation Report for NE Connector OC
ETC Design Section 13

NOTE:

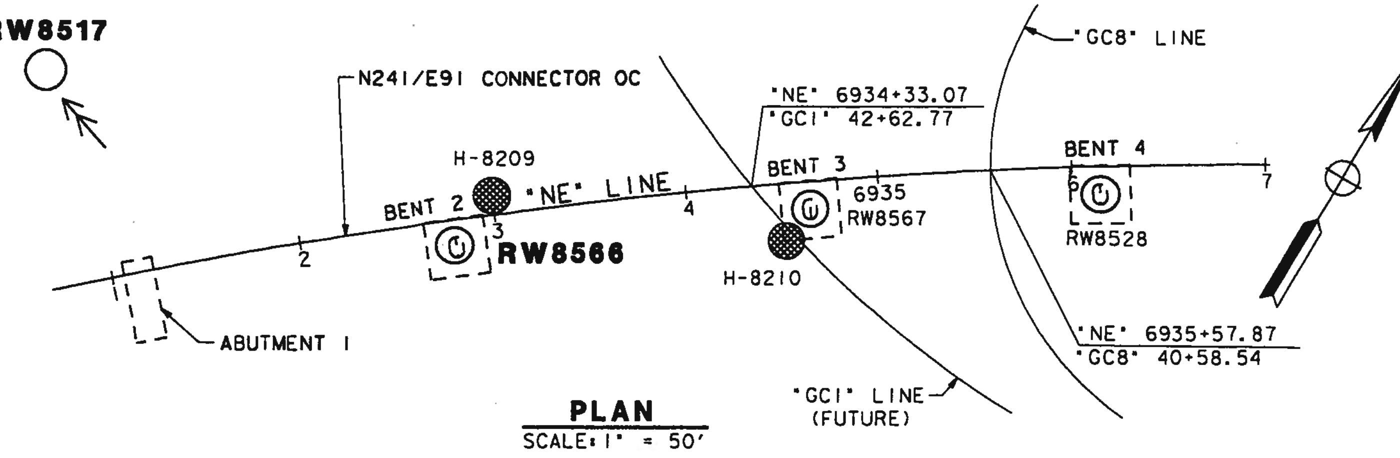
BENCHMARK: 3R 61A 80, MSL ELEV. 406.173.
ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT, A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY SILVERADO/CH2M HILL)

A ROPE-AND-PULLEY HAMMER WAS USED TO DRIVE THE SAMPLERS IN ALL BORINGS



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

PROFESSIONAL ENGINEER — REGISTERED — LAWRENCE N. PERKO — No. 2136 — Exp. 6/30/97 — GEOTECHNICAL — STATE OF CALIFORNIA

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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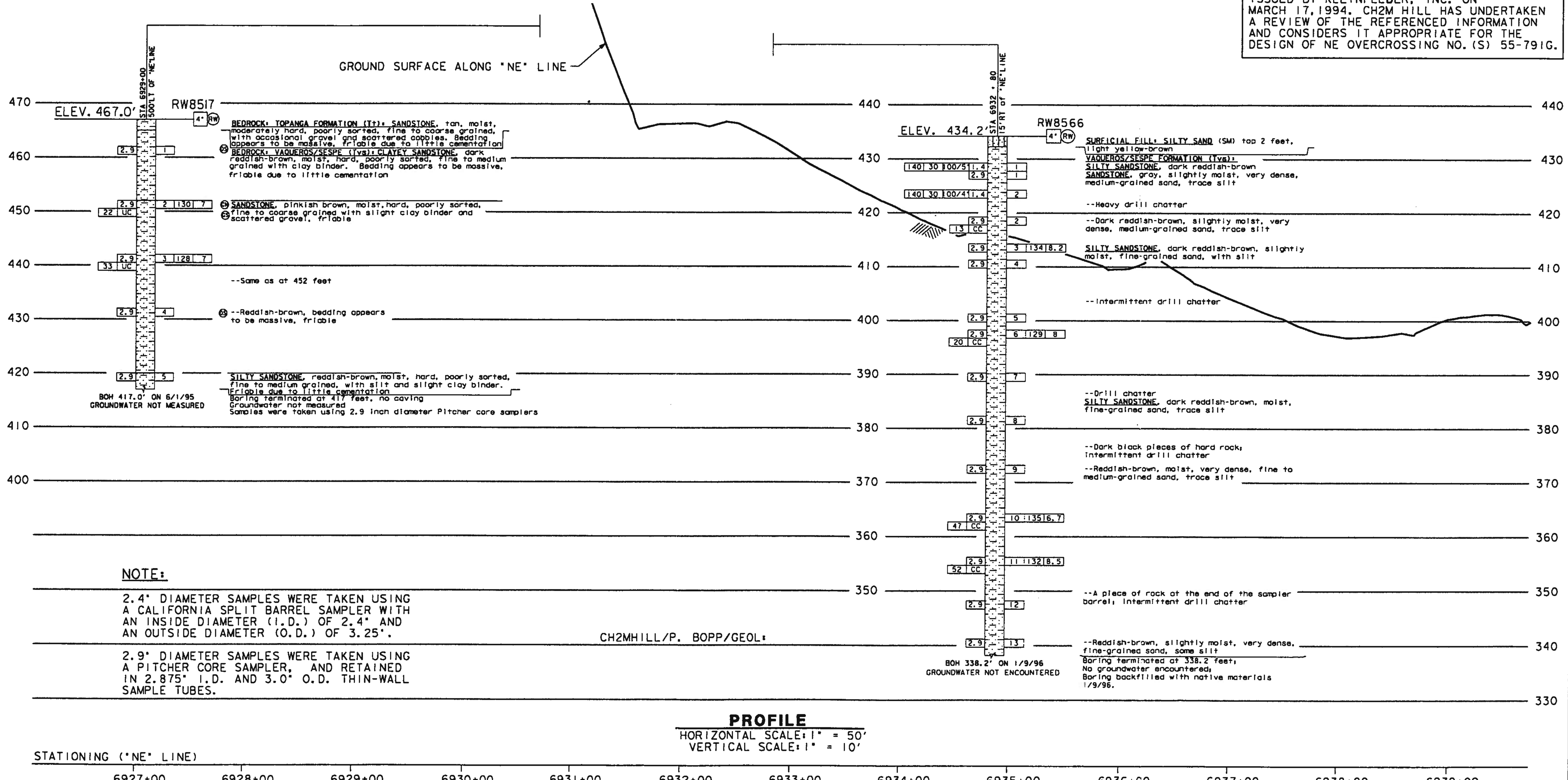

NOTE:

2.4" DIAMETER SAMPLES WERE TAKEN USING A CALIFORNIA SPLIT BARREL SAMPLER WITH AN INSIDE DIAMETER (I.D.) OF 2.4" AND AN OUTSIDE DIAMETER (O.D.) OF 3.25".

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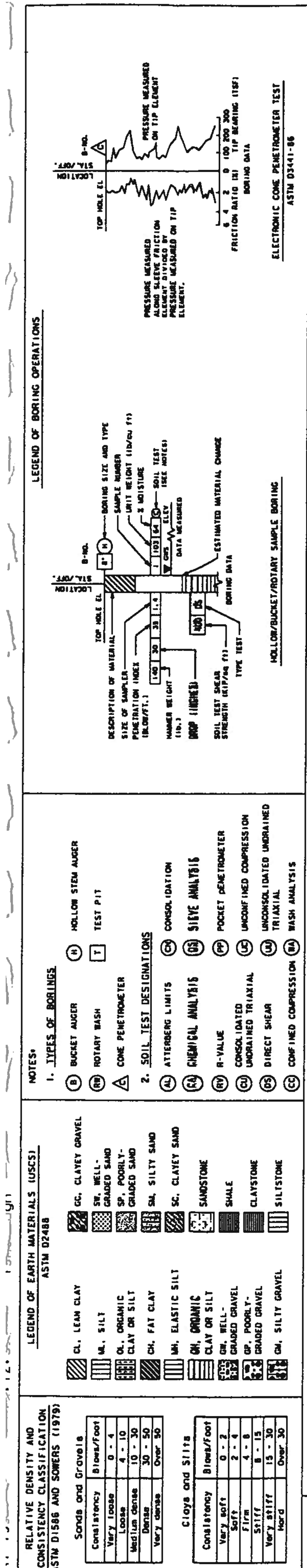


DRAWN BY	J. CRAWLEY	P. BOPP/GEOL; J. JAGANNATH/ENGR (CH2MHILL)
CHECKED BY	J. JAGANNATH	FIELD INVESTIGATOR — DATE 6/1/95 & 1/9/96

CALTRANS DESIGN OVERSIGHT

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-791G
POST MILE 16.27

N241/E91 CONNECTOR OC

LOG OF TEST BORINGS 1

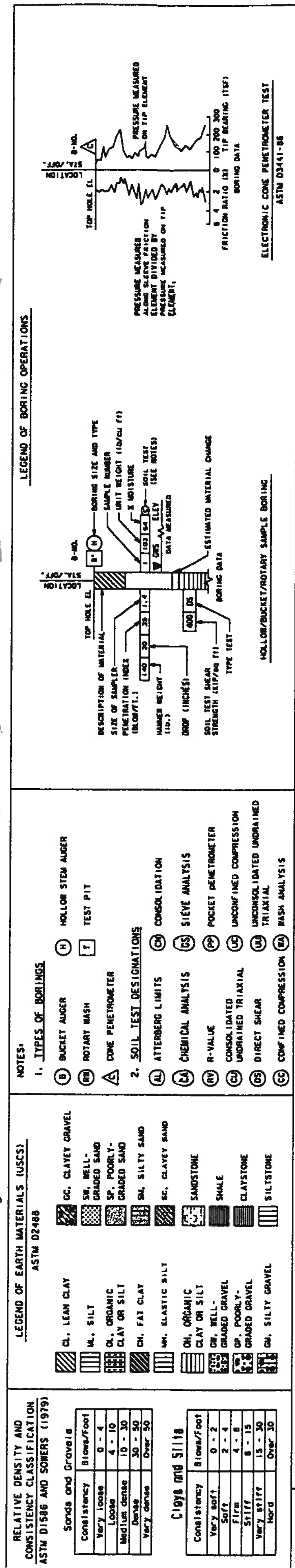
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES 5/97

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 1 OF 6



NOTE:

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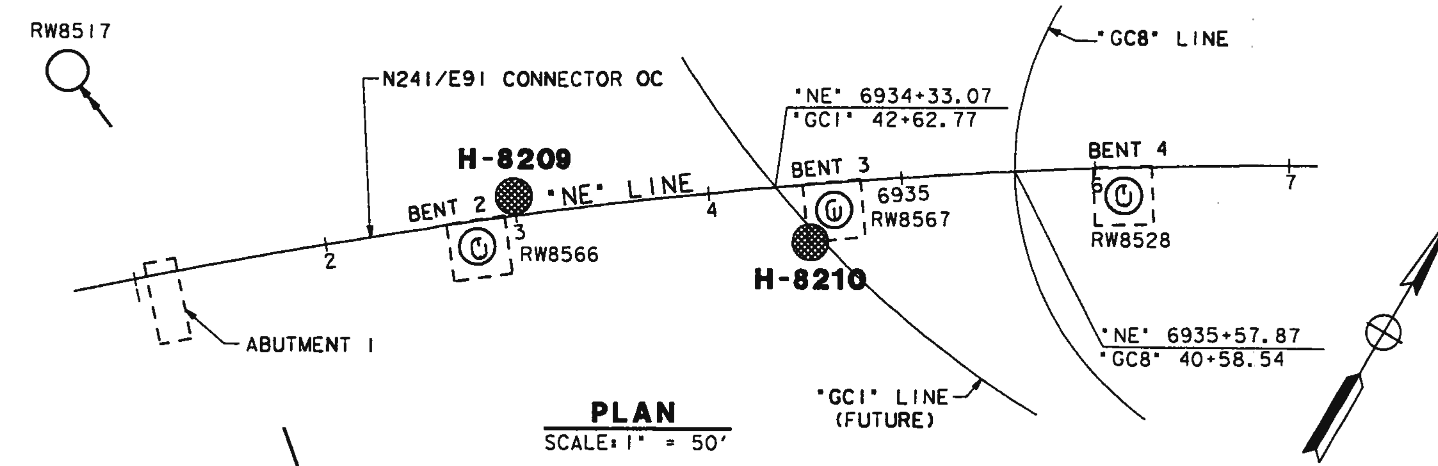
LEGEND

HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY SILVERADO/CH2M HILL)

A ROPE-AND-PULLEY HAMMER WAS USED TO DRIVE THE SAMPLERS IN ALL BORINGS



PLAN
SCALE: 1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241			

REGISTERED GEOTECHNICAL ENGINEER

PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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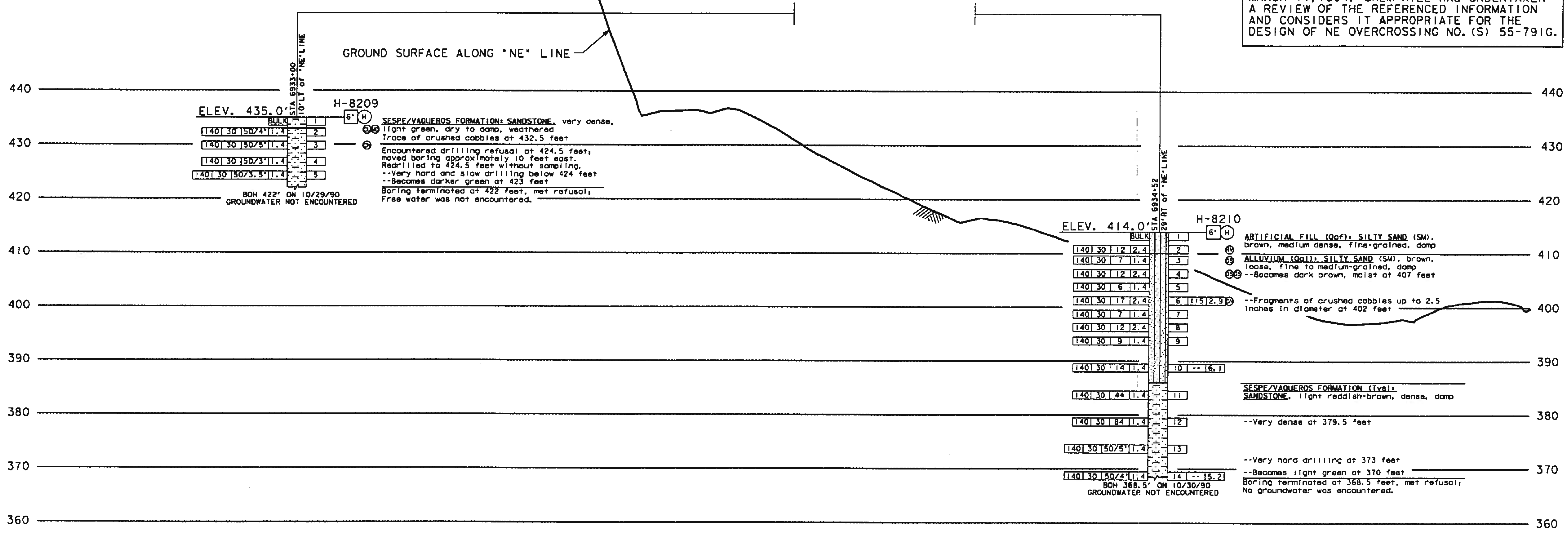

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PROFILE
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

STATIONING ("NE" LINE)

6927+00 6928+00 6929+00 6930+00 6931+00 6932+00 6933+00 6934+00 6935+00 6936+00 6937+00 6938+00 6939+00

CALTRANS DESIGN OVERSIGHT

DRAWN BY	J. CRAWLEY	M. SIERADZKI/ KLEINFELDER	FIELD INVESTIGATOR
CHECKED BY	J. JAGANNATH	10/29/90 & 10/30/90	DATE

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-791G
POST MILE 16.27

N241/E91 CONNECTOR OC

LOG OF TEST BORINGS 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/97

SHEET 2 OF 6

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241			

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER LAWRENCE H. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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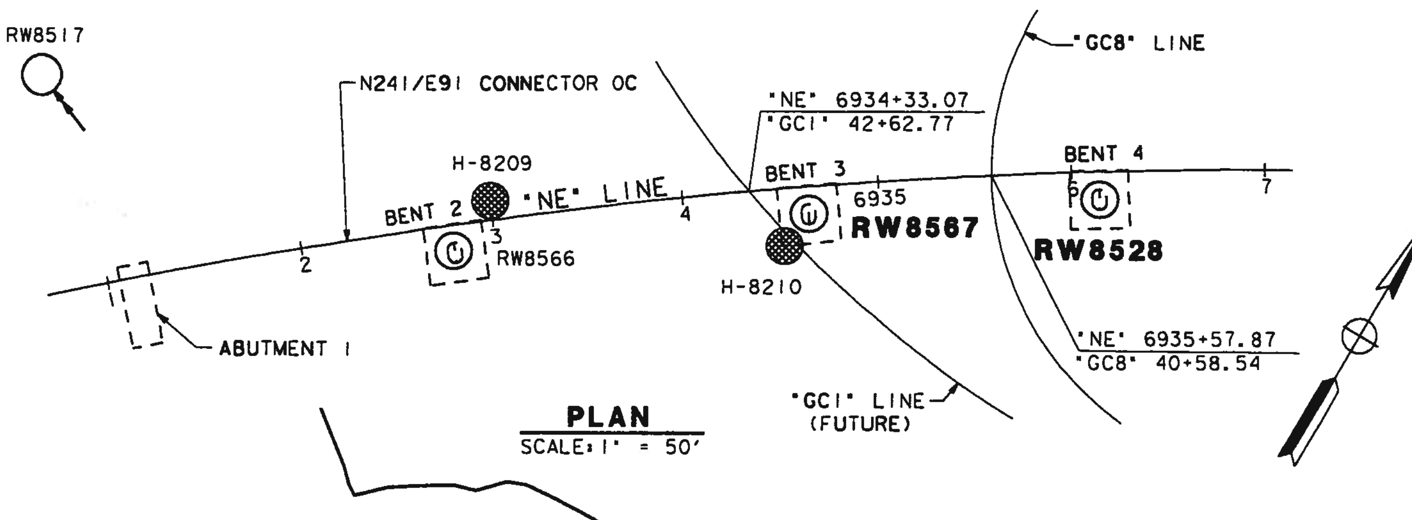
LEGEND

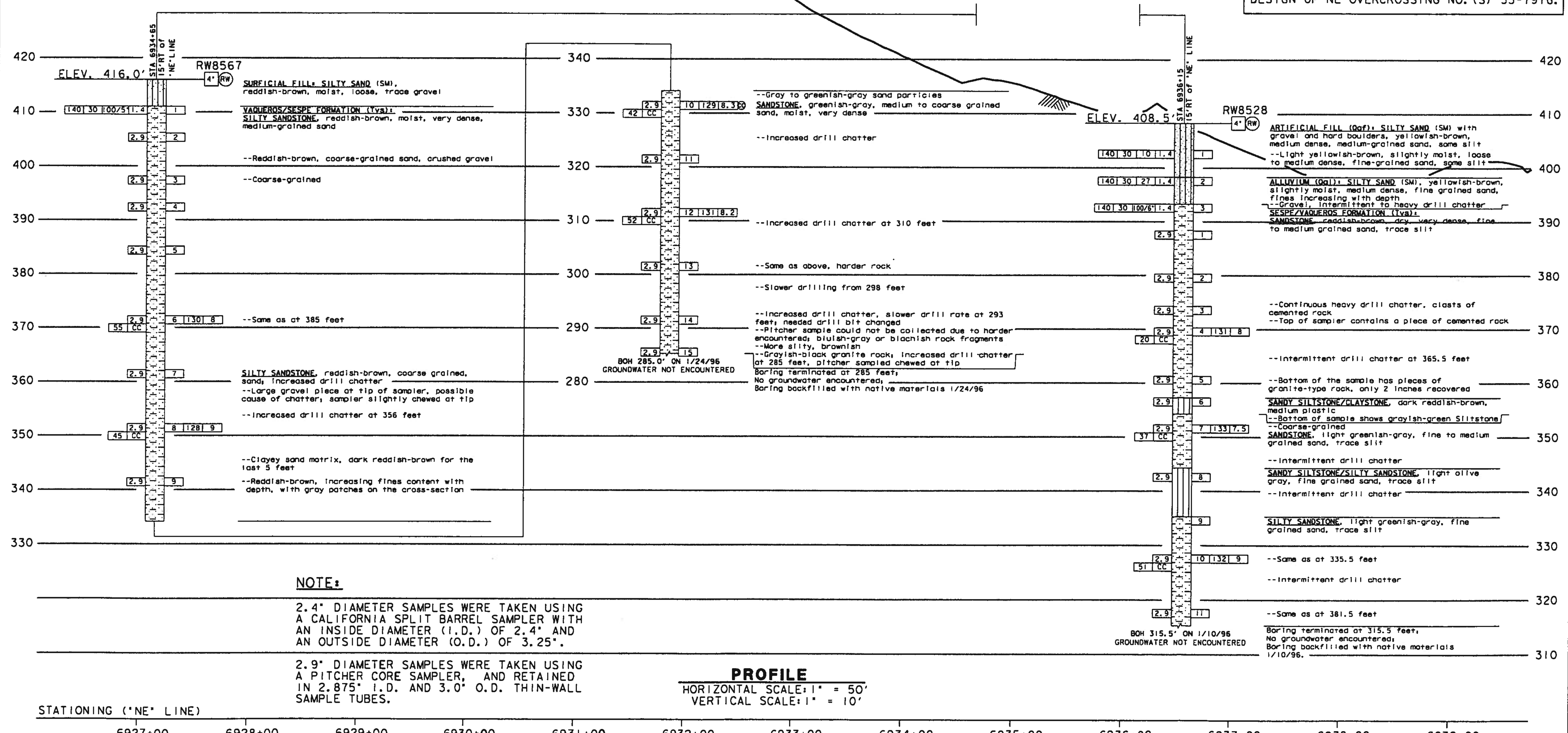
HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY SILVERADO/CH2M HILL)

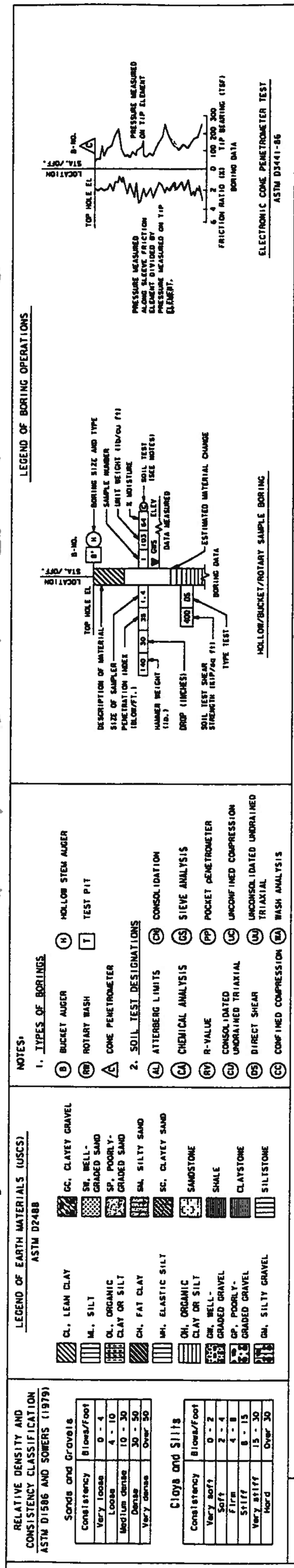
A ROPE-AND-PULLEY HAMMER WAS USED TO DRIVE THE SAMPLERS IN ALL BORINGS



PLAN
SCALE: 1" = 50'



PROFILE
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'



DRAWN BY	J. CRAWLEY	M. AZEEMUDDIN/ENGR., S. JACANNATH/ENGR (CH2M HILL) FIELD INVESTIGATOR
CHECKED BY	J. JAGANNATH	DATE 1/10/96 & 1/24/96

CALTRANS DESIGN OVERSIGHT

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-791G
POST MILE 16.27

N241/E91 CONNECTOR OC
LOG OF TEST BORINGS 3

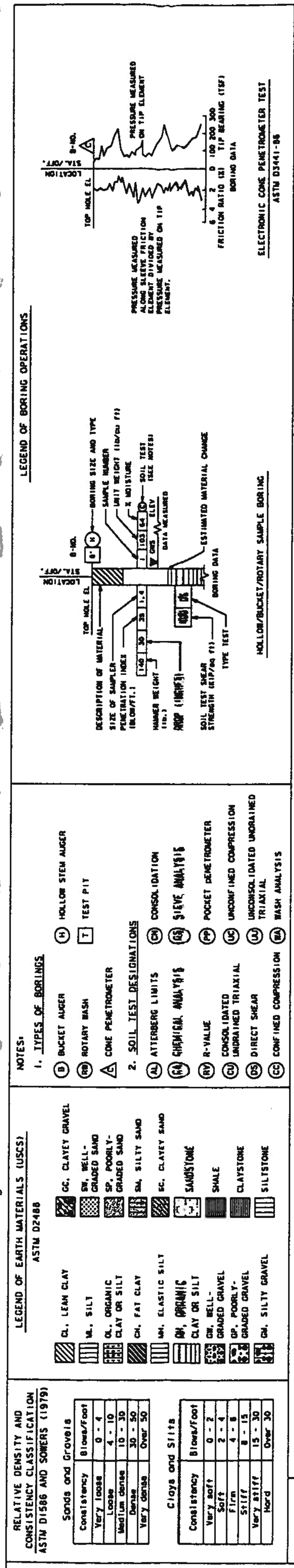
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/97

SHEET 3 OF 6



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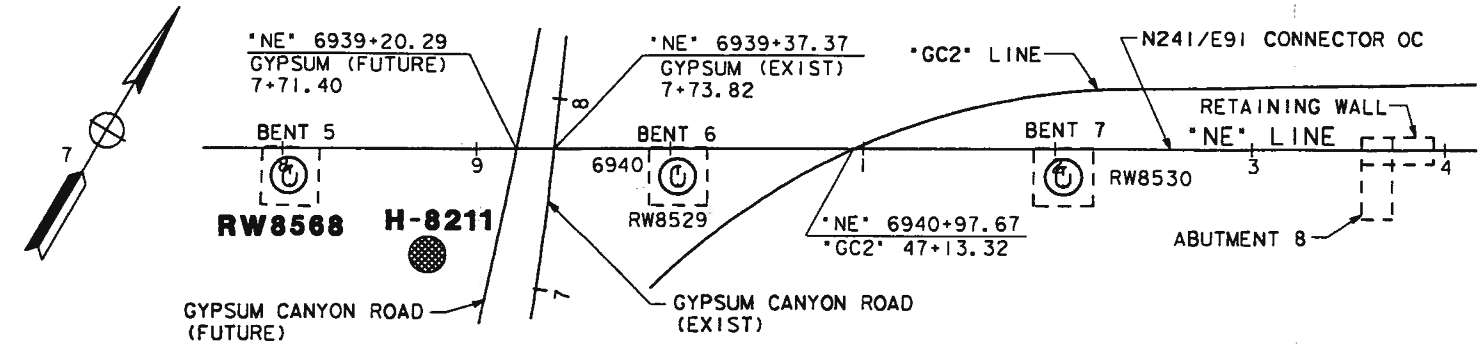
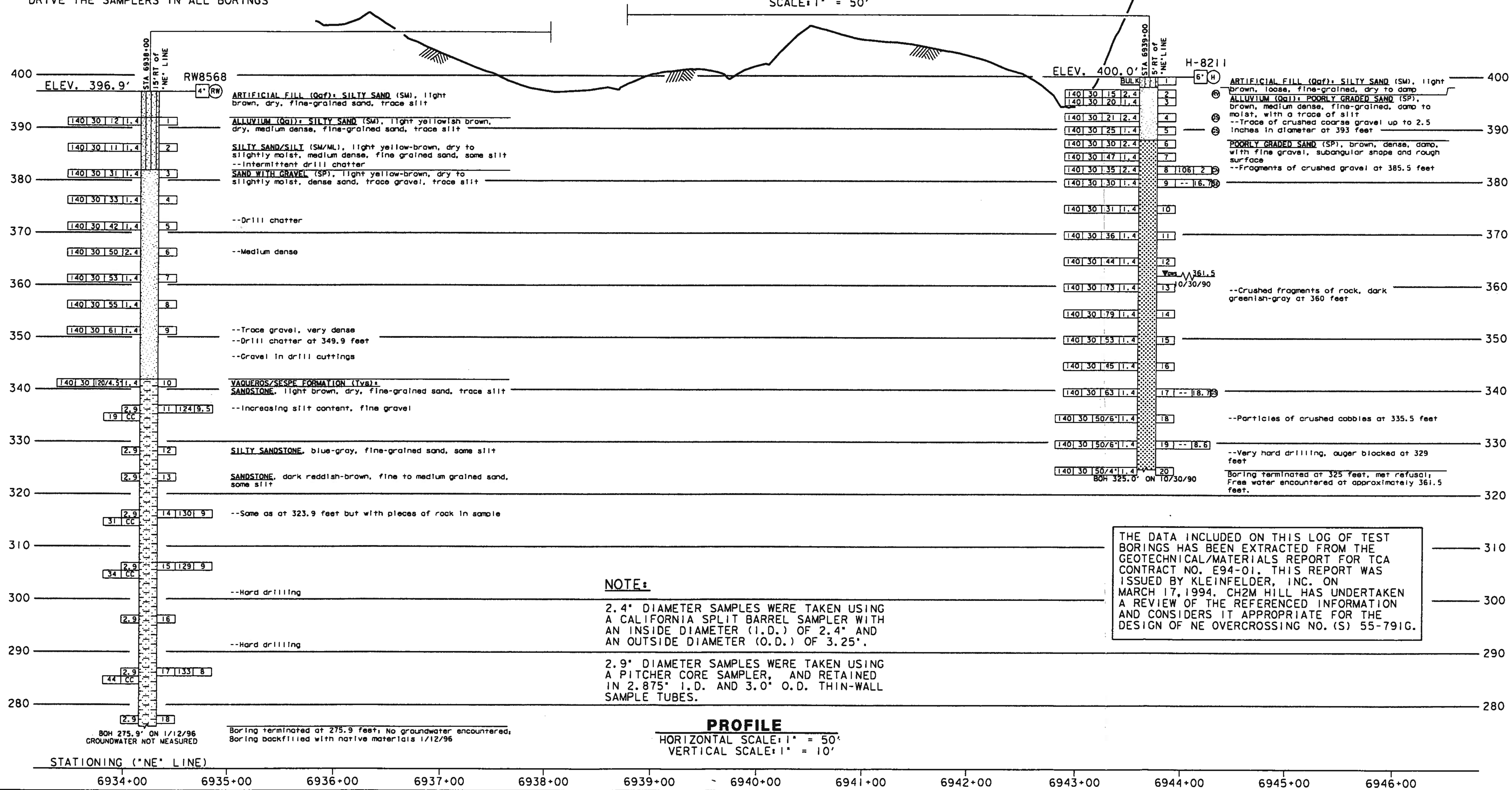
LEGEND

- HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)
- HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY SILVERADO/CH2M HILL)

A ROPE-AND-PULLEY HAMMER WAS USED TO DRIVE THE SAMPLERS IN ALL BORINGS.



PLAN
SCALE: 1" = 50'



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NOTE:

2.4" DIAMETER SAMPLES WERE TAKEN USING A CALIFORNIA SPLIT BARREL SAMPLER WITH AN INSIDE DIAMETER (I.D.) OF 2.4" AND AN OUTSIDE DIAMETER (O.D.) OF 3.25".

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PROFILE
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241			

REGISTERED GEOTECHNICAL ENGINEER
REGISTERED PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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CALTRANS DESIGN OVERSIGHT

DRAWN BY	J. CRAWLEY	M. SIERADZKI/KLEINFELDER S. JAGANNATH (ENGR)/ CH2M HILL FIELD INVESTIGATOR
CHECKED BY	J. JAGANNATH	DATE 10/23/90 & 1/12/96

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-791G
POST MILE 16.27

N241/E91 CONNECTOR OC

LOG OF TEST BORINGS 4

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY) 5/97
SHEET 4 OF 6

NOTE:

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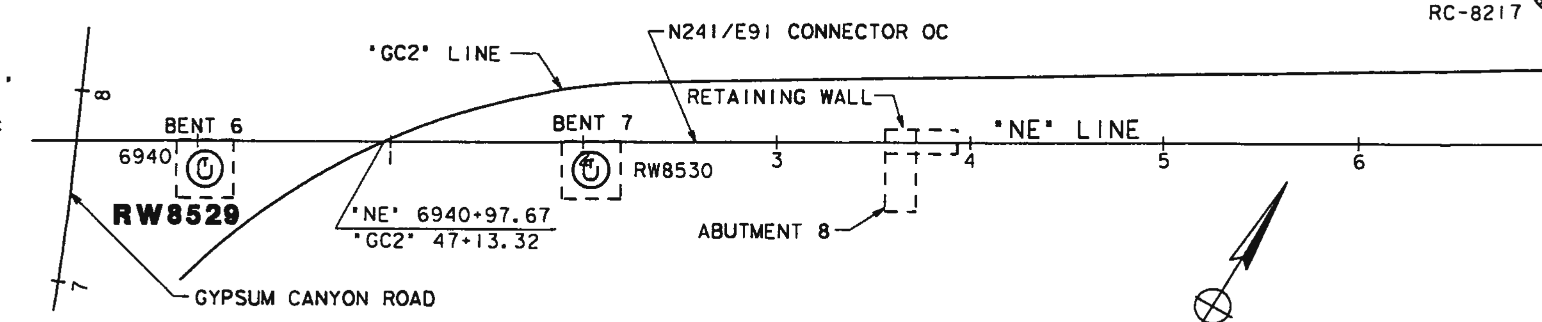
LEGEND

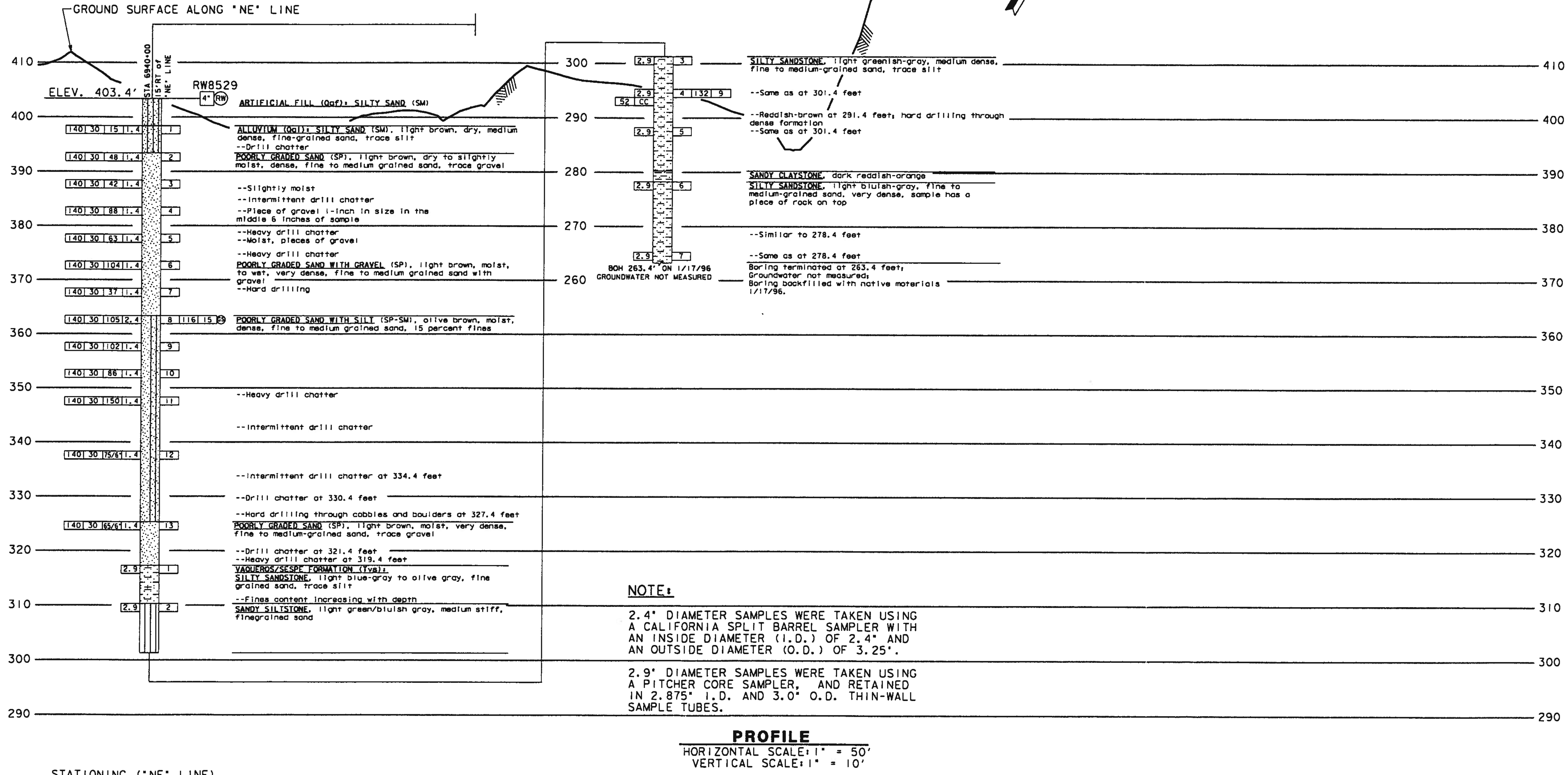
HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY SILVERADO/CH2M HILL)

A ROPE-AND-PULLEY HAMMER WAS USED TO DRIVE THE SAMPLERS IN ALL BORINGS



PLAN
SCALE: 1" = 50'



NOTE:

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PROFILE
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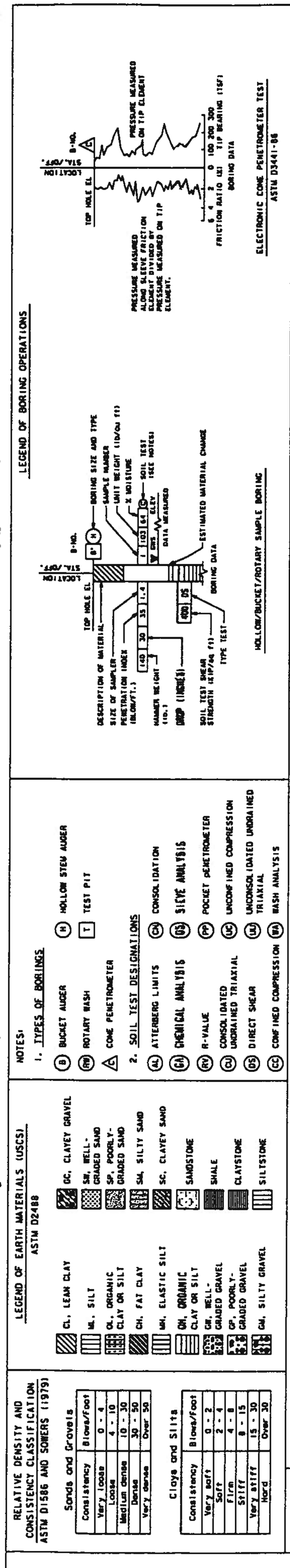

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241			

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER LAWRENCE H. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

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CALTRANS DESIGN OVERSIGHT

DRAWN BY: S. JAGANNATH/ENGR. CH2M HILL

CHECKED BY: J. JAGANNATH

CH2M HILL
FIELD INVESTIGATOR
DATE 1/17/96

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-791G
POST MILE 16.27

N241/E91 CONNECTOR OC

LOG OF TEST BORINGS 5

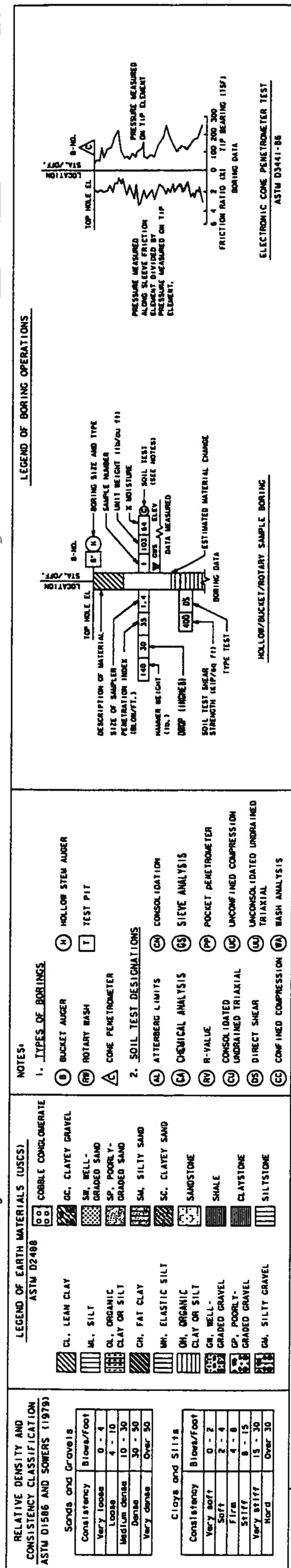
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/97

SHEET 5 OF 6



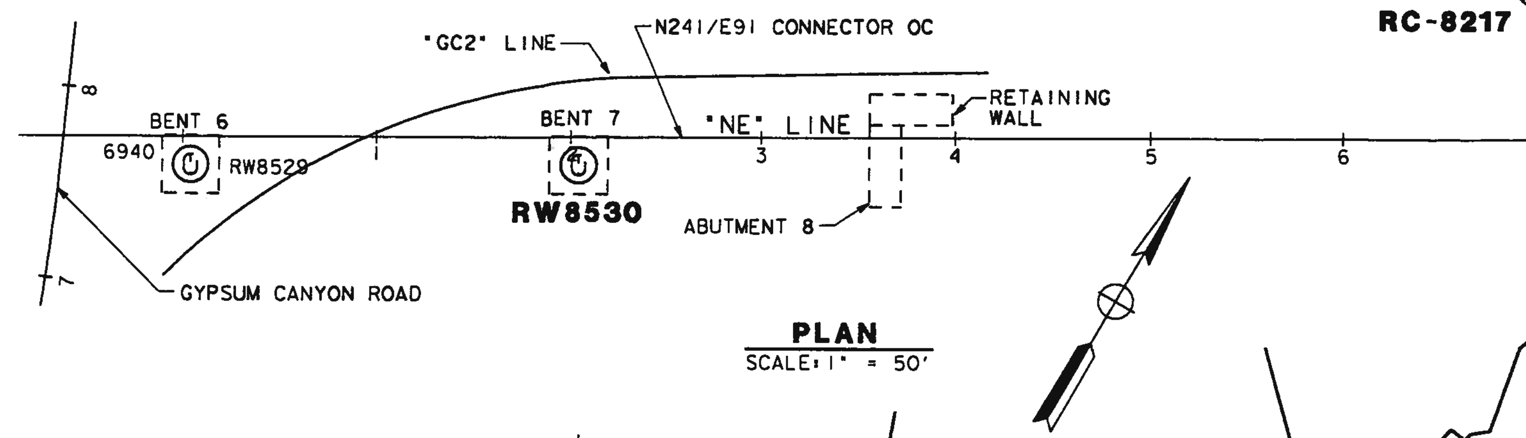
NOTE:
BENCHMARK: 3R 61A 80, MSL ELEV. 406.173.
ABOUT 1.0 MILE EAST ALONG RIVERSIDE FREEWAY FROM ITS INTERSECTION WITH GYPSUM CANYON RD. TO A CONCRETE BOX CULVERT UNDERCROSSING THE FWY., 112.5 FT. SOUTH OF SOUTH EDGE OF PAVED SHOULDER OF FWY., ON SOUTH END OF A 7.0 FT. LONG HEADWALL OF 6.0 FT. BY 5.0 FT. BOX CULVERT. A DIVISION OF HIGHWAYS DISK 2.25 INS. DIA.

LEGEND

HOLLOW-STEM AUGER/ROTARY WASH BORING (DONE BY OTHERS)

HOLLOW-STEM AUGER/ROTARY WASH BORINGS (DONE BY SILVERADO/CH2M HILL)

A ROPE-AND-PULLEY HAMMER WAS USED TO DRIVE THE SAMPLERS IN ALL BORINGS



RC-8217

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241			

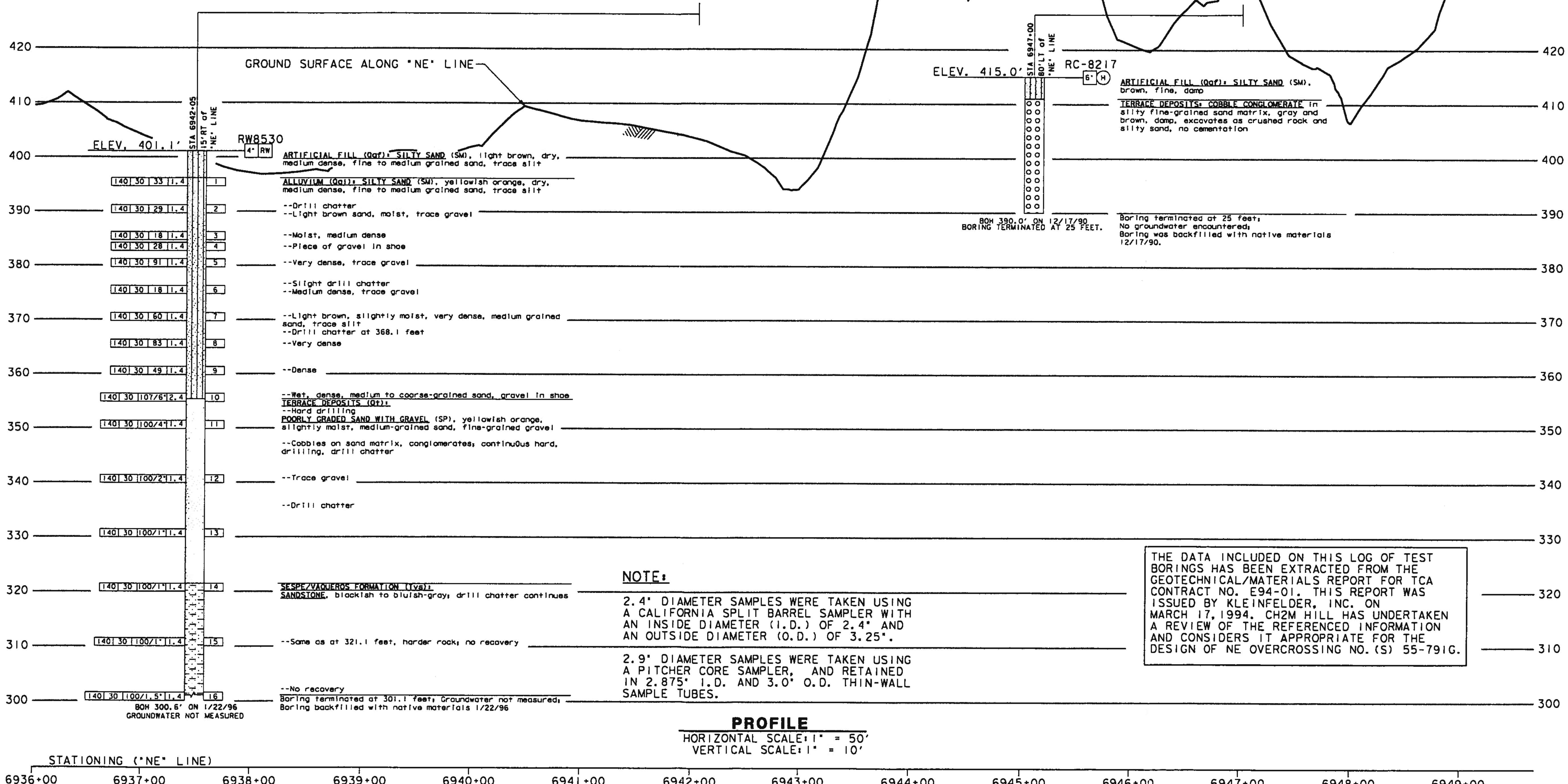
REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER LAWRENCE N. PERKO No. 2136 Exp. 6/30/97 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
2510 RED HILL AVENUE
SANTA ANA, CA 92705

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.



CALTRANS DESIGN OVERSIGHT

DRAWN BY J. CRAWLEY
CHECKED BY J. JAGANNATH

D. CARROLL/KLEINFELDER; S. JAGANNATH (ENGR)/CH2M HILL
FIELD INVESTIGATOR
DATE 12/17/90 & 1/22/96

TRANSPORTATION CORRIDOR AGENCIES

MICHAEL ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-791G
POST MILE 16.27

N241/E91 CONNECTOR OC

LOG OF TEST BORINGS 6

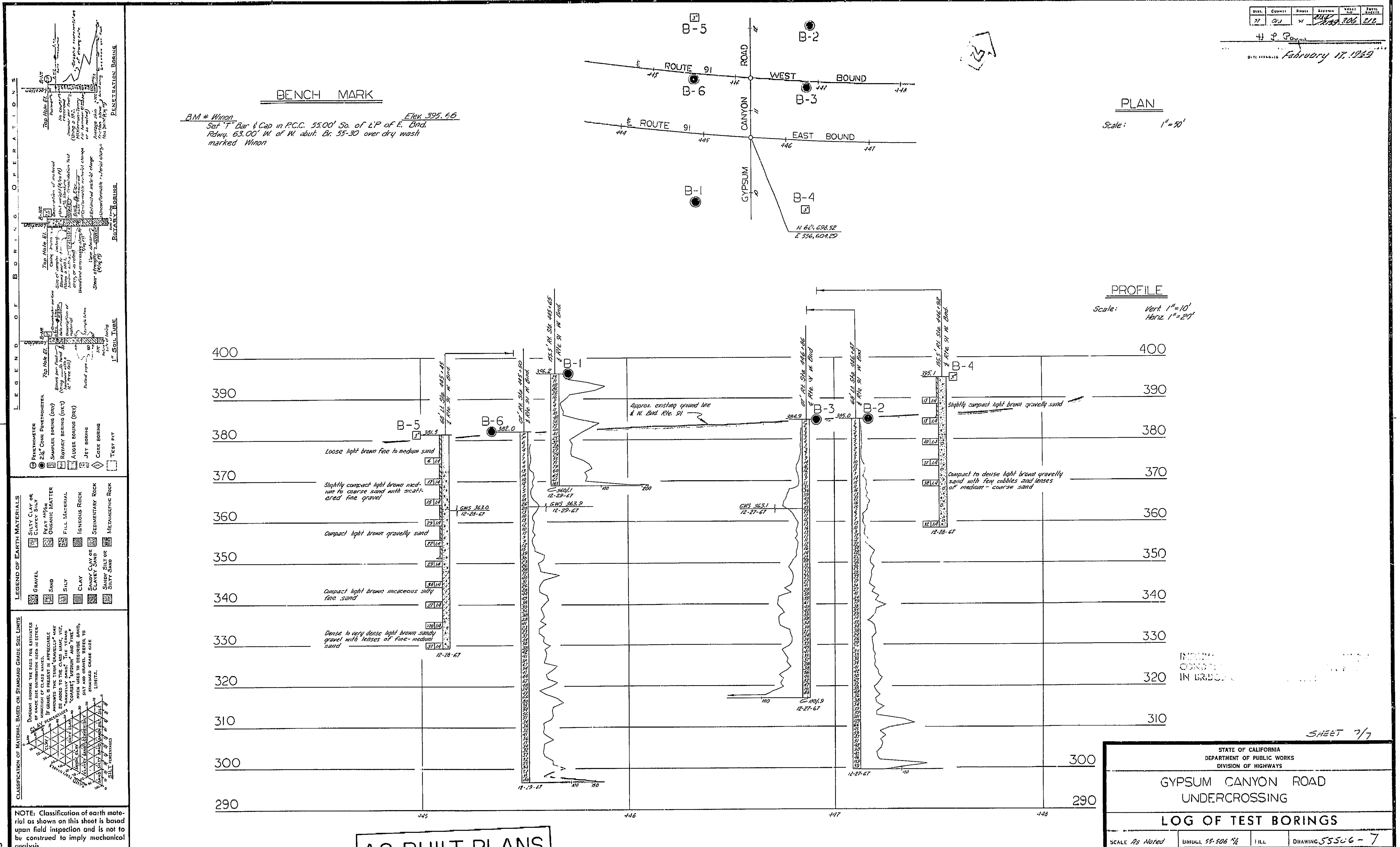
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/97

SHEET 6 OF 6



BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY By D. Wiles 12-29-67
DRAWN By G. Allen 1-11-68
CHECKED

February 17, 1969

SHEET 7/7

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GYPSUM CANYON ROAD
UNDERCROSSING

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 55-506 R/L | DRAWING 55506-7

PREL. DRAWING NO. PRO

Charge 07210
W.A. 040021

AS BUILT PLANS
Contract No. 07-040024
Date Completed
Document No. 70065928

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE 4-11-73 SIGNATURE TITLE

206

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	91	R10.1/R18.9		

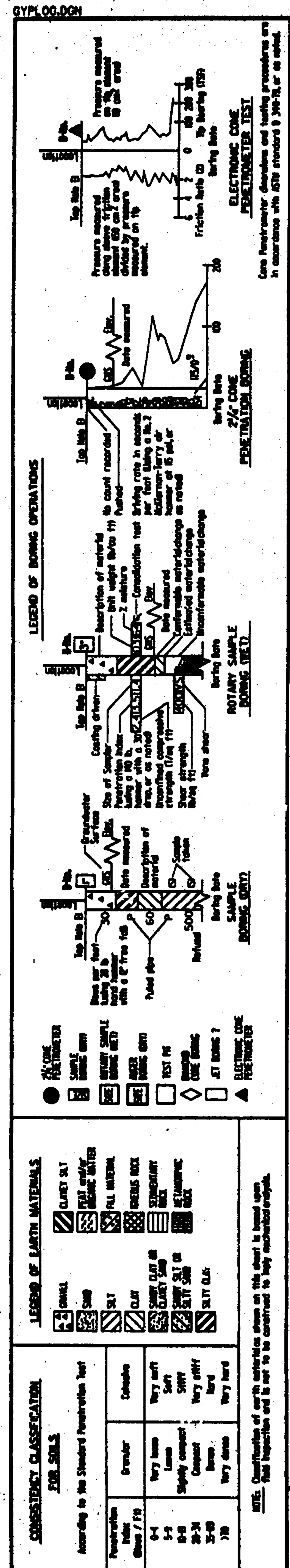
REGISTERED ENGINEER-GEOTECHNICAL

PLANS APPROVAL DATE

S. Stuart Williams No. GE 896 Exp. 12/31/92 GEOTECHNICAL STATE OF CALIFORNIA

ORANGE COUNTY TRANSP. COMM.
1055 N. MAIN ST., SUITE 516
SANTA ANA, CALIFORNIA 92701

CH2M HILL
2510 RED HILL AVE, SUITE A
SANTA ANA, CALIFORNIA 92705

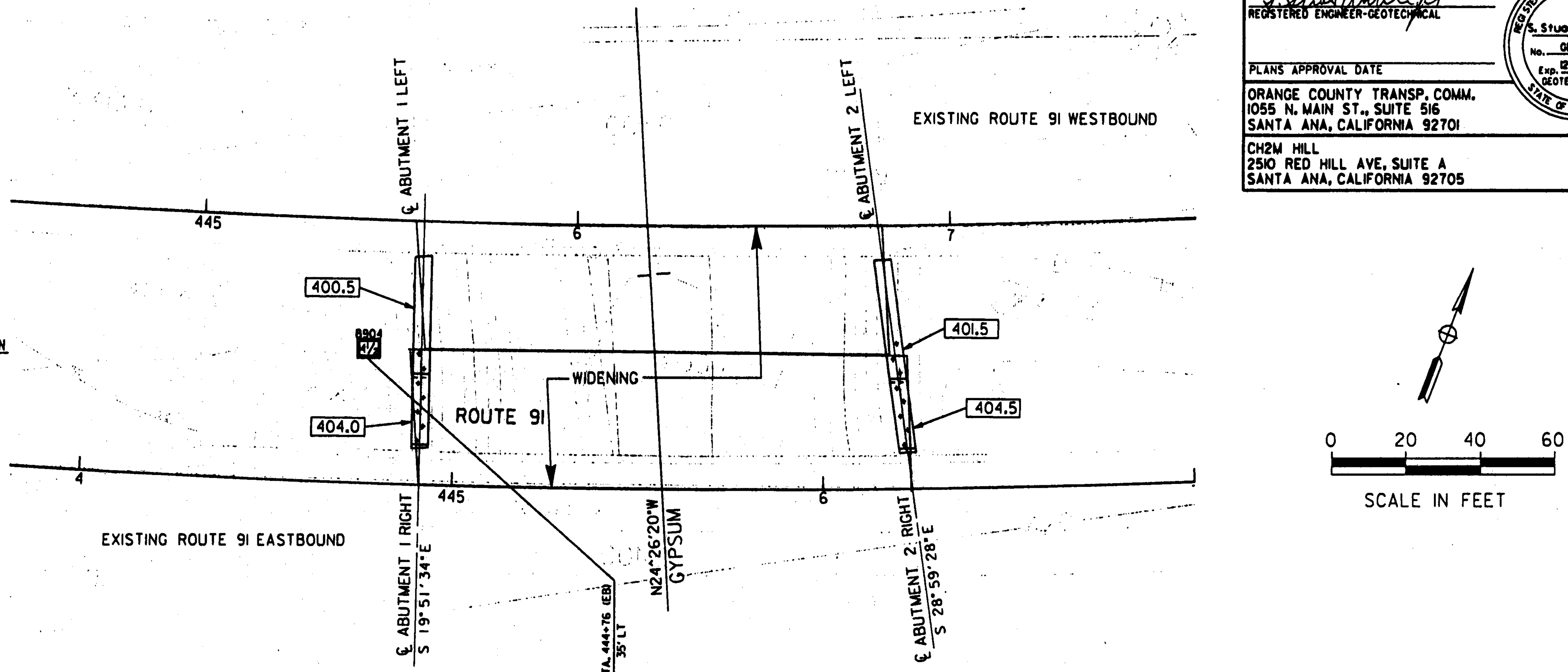


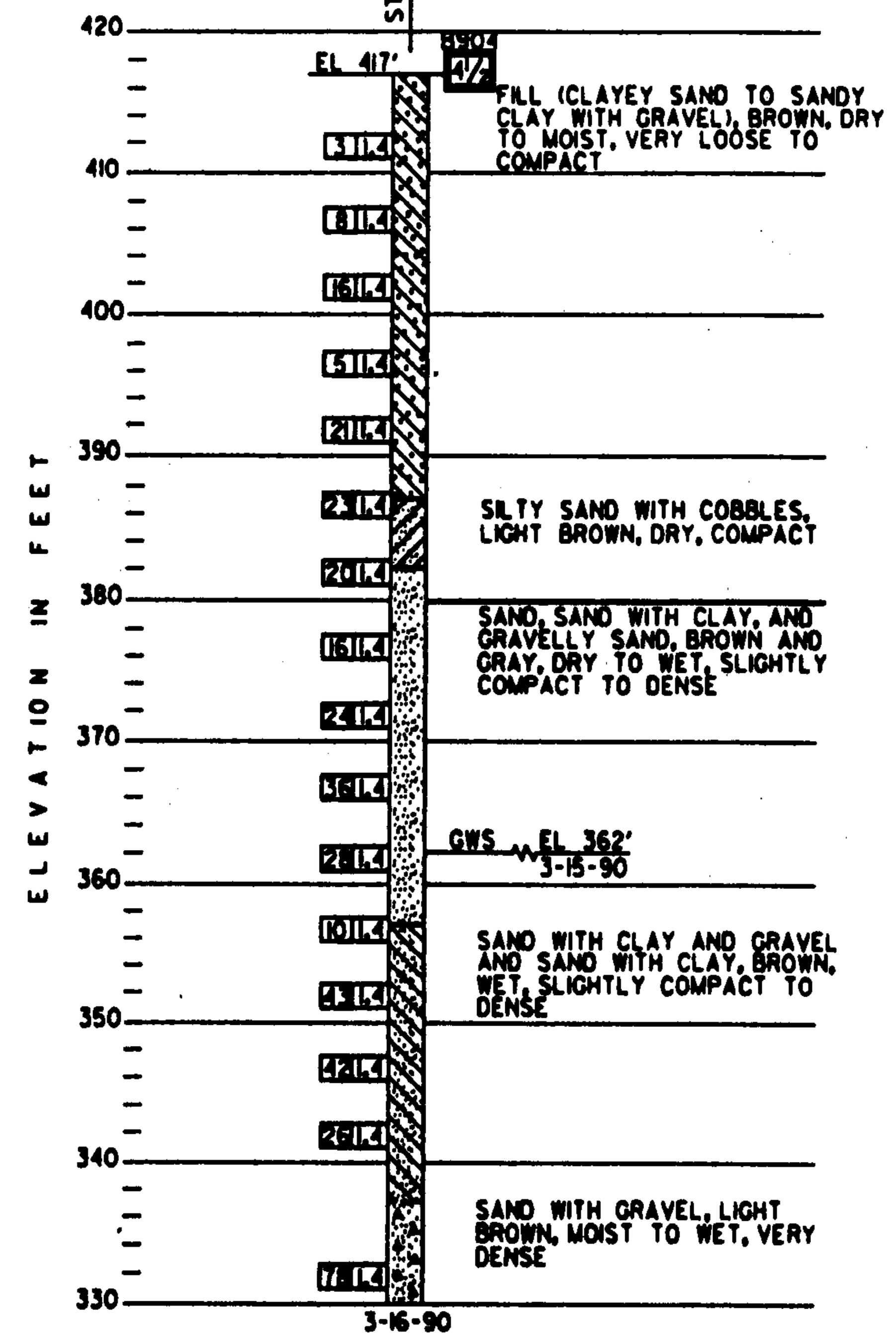
NOTES:

1. THE BORING LOGS AND RELATED INFORMATION REPRESENT THE OPINION OF THE GEOTECHNICAL ENGINEER AS TO THE CHARACTER OF THE MATERIALS AT THE LOCATIONS SHOWN. SOIL AND GROUNDWATER CONDITIONS BETWEEN ADJACENT TEST HOLES AND AT OTHER LOCATIONS MAY DIFFER FROM THOSE SHOWN. GROUNDWATER CONDITIONS MAY CHANGE WITH PASSAGE OF TIME. ALL LOCATIONS AND ELEVATIONS ARE APPROXIMATE.
2. AUGER BORINGS WERE DRILLED WITH A CME 75 DRILL RIG.
3. ELEVATIONS ARE BASED ON TOPOGRAPHIC BASE SHEET MAPPING PREPARED FOR THIS PROJECT. TEST BORING ELEVATIONS ARE IN FEET AND ARE REFERENCED TO MEAN SEA LEVEL DATUM.
4. DETAILED BORING LOGS ARE INCLUDED IN THE JULY 1990 GEOTECHNICAL BRIDGE FOUNDATION REPORT PREPARED BY CH2M HILL. FILE NO. LA028364.EI.II
5. ELEVATIONS SHOWN ARE BASED UPON OCS DATUM 1976.
6. BASIS OF BEARINGS IS CALIFORNIA STATE PLANE COORDINATE SYSTEM (1983 N.A.D.)

BENCH MARK	DESCRIPTION	ELEVATION
3R-71-71 (PM R 16.4)	STD. OCS BM DISK SET IN TOP OF A PCC HDWL. FOR A BOX CULVERT, IN THE SE'LY QUAD OF THE INTERS. OF RTE-91 AND GYPSUM CYN. RD., 265 FT. SO. OF THE SO. EDGE OF THE FWY. BRIDGE, 60 FT. SE'LY OF THE E. EDGE OF THE ON-RAMP ROAD OF THE FWY., 1FT. W'LY OF THE E'LY END OF THE HDWL., LEVEL WITH THE ROAD. (OCS VERT. CON. REV. 1986 PG 09-2) (PSOMAS SR 89-013 PG-152)	397.861

7. [ ] INDICATES BOTTOM OF FOOTING ELEVATION. FOR PILE LAYOUT SEE OTHER SHEETS.





DESIGN OVERSIGHT 3/6/92 SIGN OFF DATE	DRAWN BY M. REICHERT	E. M. SMITH FIELD INVESTIGATOR	APPROVAL RECOMMENDED BY L. PERKO	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
	CHECKED BY E. M. SMITH	REGISTRATION NO.	REGISTRATION NO. CE44359	

KENT CORDTZ
PROJECT ENGINEER

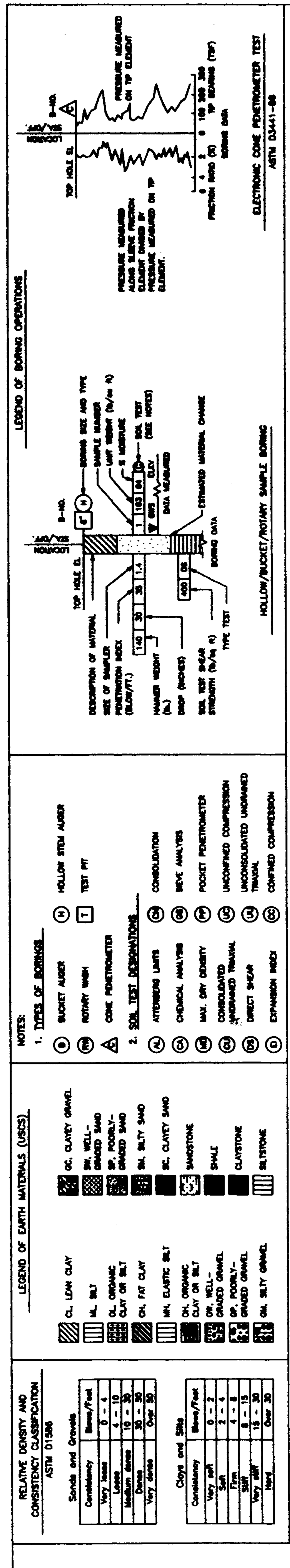
BRIDGE NO.	
55-506 R/L	GYPSUM CANYON ROAD U.C. (WIDEN)
POST MILE 16.40	LOG OF TEST BORINGS

CU 12207
EA 12-926004

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 8 OF 9



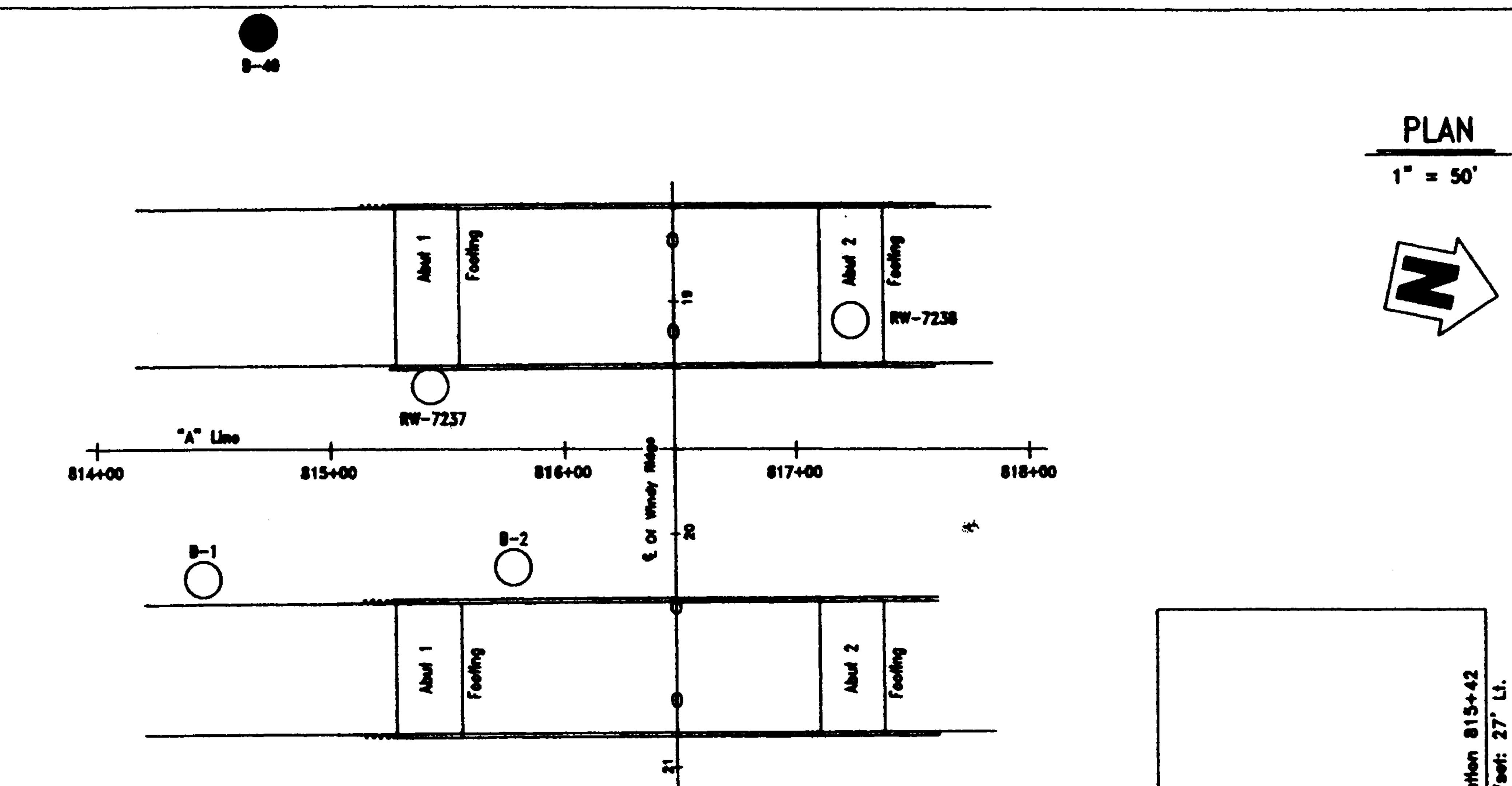
BENCHMARK - 3KK-27-85

IN THE NORTHERLY CORNER OF THE INTERSECTION OF SANTA ANA CANYON ROAD & WEIR CANYON ROAD, 64 FEET NORTHERLY FROM THE CENTERLINE OF SANTA ANA CANYON ROAD 111 FEET NORTHEASTERLY FROM THE CENTERLINE OF WEIR CANYON ROAD; SET IN TOP OF SOUTHEASTERLY CORNER OF A 4.5 FT. X 22 FT. CONCRETE CATCH BASIN

Elevation per 1976 Adjustment - 434.403

RW-7328 APPROXIMATE LOCATIONS OF BOREHOLES DRILLED DURING THE CURRENT INVESTIGATION

B-40 APPROXIMATE LOCATIONS OF BOREHOLES DRILLED BY WOODWARD-CLYDE (1988)



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241	36.5-38.1	575	576

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER ROSS KHIABANI No. 2202 Exp. 6/30/00 GEOTECHNICAL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2MHILL
2485 NATOMAS DRIVE, STE 600
SACRAMENTO, CA 95833-2937

LEIGHTON & ASSOCIATES, INC.
17781 COWAN
IRVINE, CA-92714

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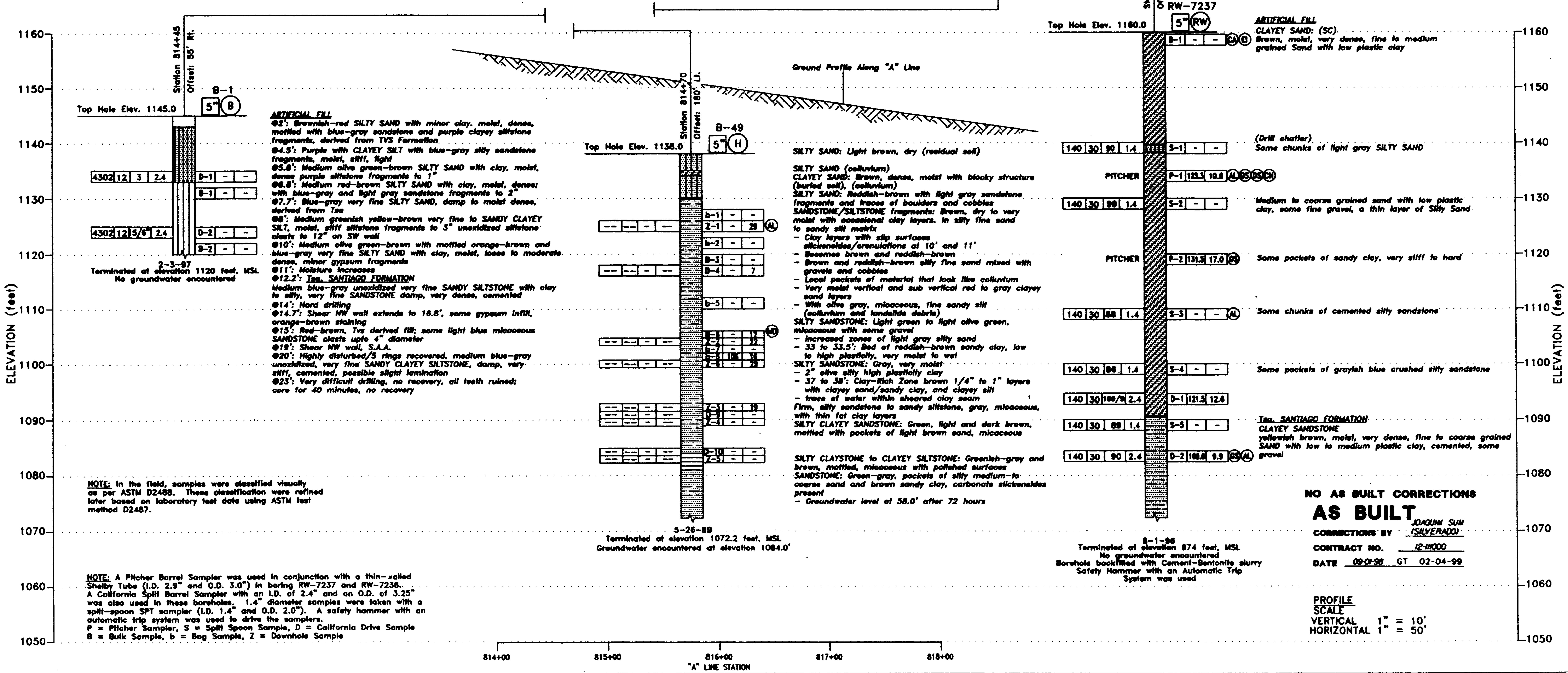
APPROVED FOR CONSTRUCTION
Date: 08/10/98
Silverado
Date of Approval for Construction: 01/06/98
DCN: R15148 Section: 12



NOTE: In the field, samples were classified visually as per ASTM D2488. These classification were refined later based on laboratory test data using ASTM test method D2487.

NOTE: A Pitcher Barrel Sampler was used in conjunction with a thin-walled Shelby Tube (I.D. 2.9" and O.D. 3.0") in boring RW-7237 and RW-7238. A California Split Barrel Sampler with an I.D. of 2.4" and an O.D. of 3.25" was also used in these boreholes. 1.4" diameter samples were taken with a split-spoon SPT sampler (I.D. 1.4" and O.D. 2.0"). A safety hammer with an automatic trip system was used to drive the samplers.
P = Pitcher Sampler, S = Split Spoon Sample, D = California Drive Sample
B = Bulk Sample, b = Bag Sample, Z = Downhole Sample

NO AS BUILT CORRECTIONS

AS BUILT

CORRECTIONS BY JOAQUIM SUM (SILVERADO)

CONTRACT NO. 12-1110O0

DATE 09-01-98 GT 02-04-99

PROFILE SCALE
VERTICAL 1" = 10'
HORIZONTAL 1" = 50'

CALTRANS DESIGN OVERSIGHT 4/13/98

DRAWN BY CAMI MCKAY KAREN PEREZ

CHECKED BY R. KHIABANI S. GUHA

WOODWARD-CLYDE SILVERADO
FIELD INVESTIGATOR
DATE

TRANSPORTATION CORRIDOR AGENCIES

MIKE ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-724 R/L
POST MILE 36.7

WINDY RIDGE WILDLIFE UC
LOG OF TEST BORINGS (1 OF 2)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES 4-17-97 4-6-98

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 18 OF 19

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241	36.5-38.1	576	596

REGISTERED GEOTECHNICAL ENGINEER

ROSS KHIABANI No. 2202 Exp. 6/30/00 GEOTECHNICAL REGISTERED PROFESSIONAL ENGINEER STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2MHILL
2485 NATOMAS DRIVE, STE 600
SACRAMENTO, CA 95833-2937

LEIGHTON & ASSOCIATES, INC.
17781 COWAN
IRVINE, CA-92714

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APPROVED FOR CONSTRUCTION
Date: 08/10/98
Silverado
Date of Approval for Construction: 01/08/98
DCN: R15148 Section: 12

CALTRANS DESIGN OVERSIGHT 4/13/98

DRAWN BY	CAMI MCKAY KAREN PEREZ	WOODWARD-CLYDE SILVERADO
CHECKED BY	R. KHIABANI S. GUHA	FIELD INVESTIGATOR / DATE

TRANSPORTATION CORRIDOR AGENCIES

MIKE ENDRES
TCA PROJECT MANAGER

BRIDGE NO. 55-724 R/L
POST MILE 36.7

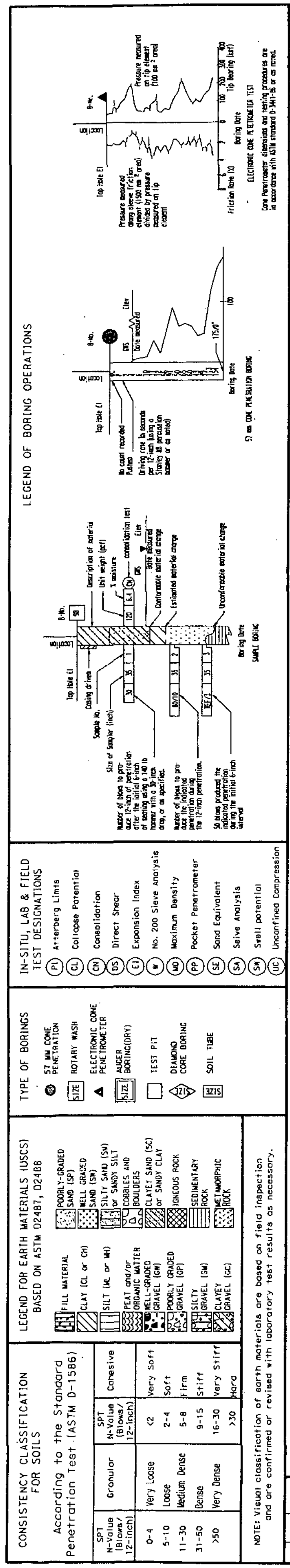
WINDY RIDGE WILDLIFE UC
LOG OF TEST BORINGS (2 OF 2)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

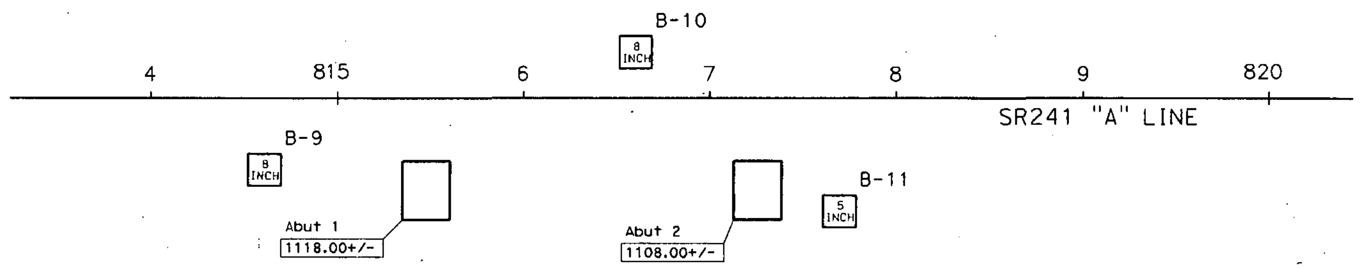
CU 12-240
EA 111000

DISREGARD PRINTS BEARING EARLIER REVISION DATES 4-17-97 4-6-98

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET 19A OF 18



Granular SPT N-Value (Blows/12-inch)	Granular	Cohesive SPT N-Value (Blows/12-inch)	Cohesive
0-4	Very Loose	<2	Very Soft
5-10	Loose	2-4	Soft
11-30	Medium Dense	5-8	Firm
31-50	Dense	9-15	Stiff
>50	Very Dense	16-30	Very Stiff
		>30	Hard



PLAN

1"=50ft

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	Ora	241	35.1-38.1	218	220

REGISTERED GEOTECHNICAL ENGINEER 6/20/08 DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER SHIN-WEI SU No. GE2696 Exp. 06/30/09 GEOTECHNICAL STATE OF CALIFORNIA

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DIAZ YOURMAN & ASSOCIATES
1616 E. 17TH STREET
SANTA ANA, CA 92705

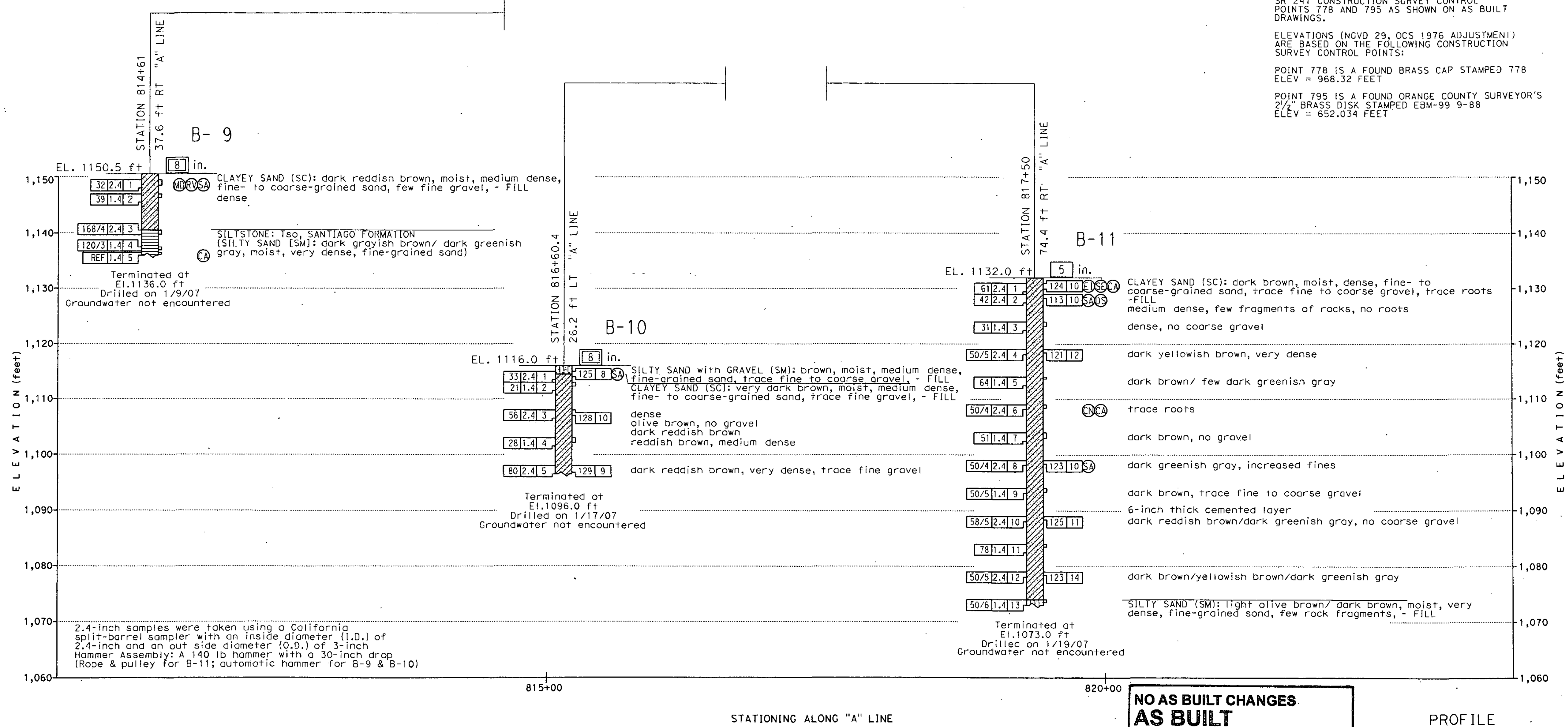
PARSONS
2201 DUPONT DRIVE
SUITE 200
IRVINE, CA 92612

UNLESS OTHERWISE NOTED, ALL COORDINATE DISTANCES AND BEARINGS ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM (CCS83), ZONE VI, 1983 NAD (1988 EPOCH) USING SR 241 CONSTRUCTION SURVEY CONTROL POINTS 778 AND 795 AS SHOWN ON AS BUILT DRAWINGS.

ELEVATIONS (NGVD 29, OCS 1976 ADJUSTMENT) ARE BASED ON THE FOLLOWING CONSTRUCTION SURVEY CONTROL POINTS:

POINT 778 IS A FOUND BRASS CAP STAMPED 778
ELEV = 968.32 FEET

POINT 795 IS A FOUND ORANGE COUNTY SURVEYOR'S 2 1/2" BRASS DISK STAMPED EBM-99 9-88
ELEV = 652.034 FEET



STATIONING ALONG "A" LINE

NO AS BUILT CHANGES
AS BUILT
CORRECTIONS BY
CONTRACT NO. K 000383
DATE 03-29-2010

PROFILE

VERTICAL 1"=10ft
HORIZONTAL 1"=50ft

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN

Jon Hamaguchi DESIGN OVERSIGHT 9/5/08 SIGN OFF DATE	DRAWN BY	J. LEE	FIELD INVESTIGATION BY: T. KOTA January 2007	MICHAEL ENDRES TCA PROJECT ENGINEER	TRANSPORTATION CORRIDOR AGENCY	BRIDGE NO. 55-724R	WINDY RIDGE WILDLIFE UC (WIDEN)
	CHECKED BY	S. SU				POST MILES 36.7	LOG OF TEST BORINGS 1 OF 3

DATE PLOTTED => $DATE
TIME PLOTTED => $TIME
LAST REVISION 00-00-00

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => $USER
DGN FILE => $REQUEST

CU 12242

EA 0G0111

Appendix C
As-built Maps

REVISED FINAL

Geotechnical Certification Report

Design Section 12 North (Stations 851+00 to 880+00)
And Design Section 13

June 19, 1998
(Revised October 15, 1999)

(Volume I of II)

P.M. = 36.45 to 38.10, CU. = 12-240, EA. = 111000

Submitted to

Transportation Corridor Agencies

Submitted by

Silverado
CONSTRUCTORS
A JOINT VENTURE OF FCI CONSTRUCTORS, SUKUT CONSTRUCTION, INC., WAYSS & FREYTAG AND OBAYASHI CORPORATION, SUPPORTED BY CH2M HILL

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241	33.6 - 38.0	17	512

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

ASL Consulting Engineers
ONE JENNER STREET, STE. 200
IRVINE, CA 92718

REGISTERED PROFESSIONAL ENGINEER FRANK D. CURRIE No. 45605 Exp. 12/31/98 CIVIL STATE OF CALIFORNIA

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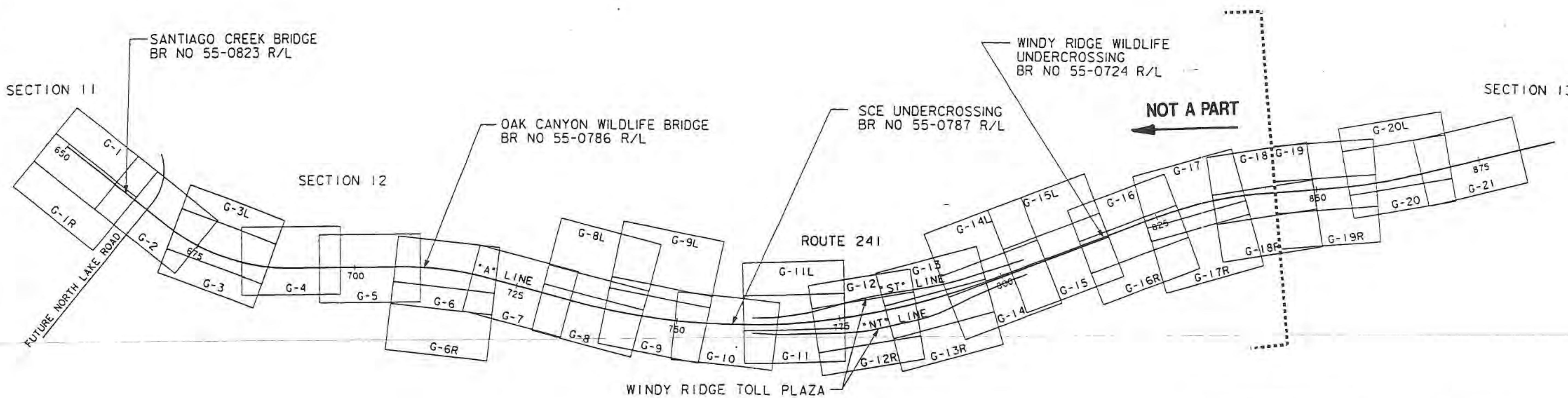
TCA PROJECT MANAGER MICHAEL ENDRES

CALCULATED/DESIGNED BY RB DATE 1/96 REVISED BY

CHECKED BY MC 5/96 DATE REVISED

TOLL ROAD OVERSIGHT

TRANSPORTATION CORRIDOR AGENCIES



LINE NAME	LINE DESCRIPTION
"ST" LINE	SOUTHBOUND TOLL PLAZA LINE
"NT" LINE	NORTHBOUND TOLL PLAZA LINE
"A" LINE	ROUTE 241 MAIN LINE

APPROVED FOR CONSTRUCTION	
Date: 02/19/98	
Silverado	
Date of Approval for Construction: 01/15/98	
DCN: R15290	Section: 11/12

SECTION 12 NORTH

PLATE A

KEY MAP AND LINE INDEX
CONTOUR GRADING AND
DRAINAGE SHEETS
NO SCALE

K-2

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 12209

EA 012501

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9	17	60C

08-01-96
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

PROFESSIONAL ENGINEER
REGISTERED
L. VANDERLINDEN
No. C46300
Exp. 12-31-98
CIVIL
STATE OF CALIFORNIA

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

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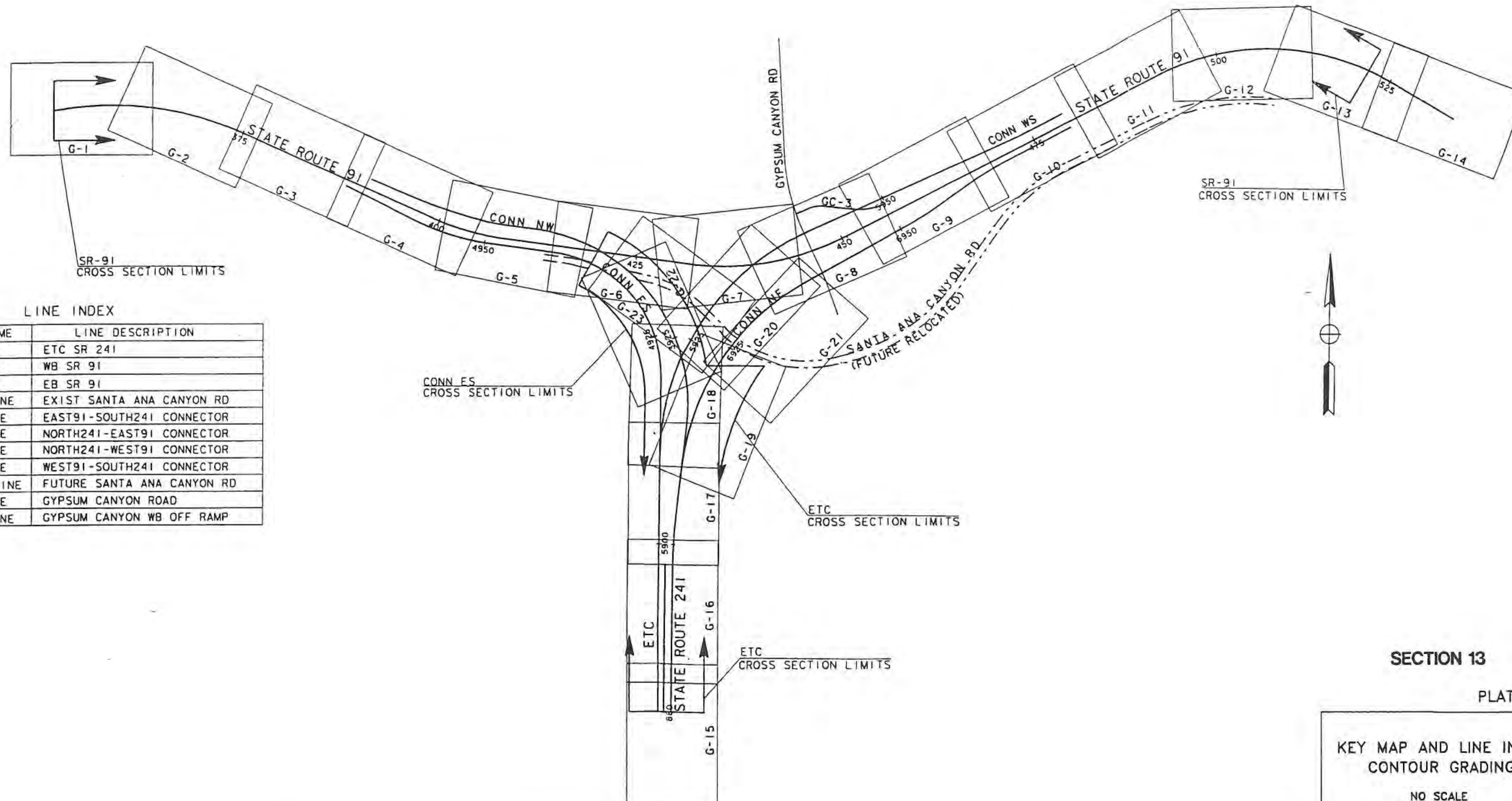
APPROVED FOR CONSTRUCTION

Date: 11/26/97

Silverado

Date of Approval for Construction: 11/21/97

DCN: R14637 | Section: 13



LINE INDEX

LINE NAME	LINE DESCRIPTION
"A" LINE	ETC SR 241
"B" LINE	WB SR 91
"C" LINE	EB SR 91
"SAC" LINE	EXIST SANTA ANA CANYON RD
"ES" LINE	EAST91-SOUTH241 CONNECTOR
"NE" LINE	NORTH241-EAST91 CONNECTOR
"NW" LINE	NORTH241-WEST91 CONNECTOR
"WS" LINE	WEST91-SOUTH241 CONNECTOR
"FSAC" LINE	FUTURE SANTA ANA CANYON RD
"GC" LINE	GYPSUM CANYON ROAD
"GC3" LINE	GYPSUM CANYON WB OFF RAMP

SECTION 13

PLATE B

KEY MAP AND LINE INDEX
CONTOUR GRADING

NO SCALE

K-2

CALCULATED/ DESIGNED BY	RB	DATE 1/98	REVISED BY
CHECKED BY	MC	5/98	DATE REVISED

TCA PROJECT MANAGER: MICHAEL ENDRES

TOLL ROAD OVERSIGHT

TRANSPORTATION CORRIDOR AGENCIES

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 12209

EA 012501

TEAD (34 11 STANDARD 2CL PLNSHT (REV. 1/90)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241	33.6 - 38.0		

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

ASL Consulting Engineers
ONE JENNER STREET, STE.200
IRVINE, CA 92718

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

LEGEND

SURFICIAL UNITS (Circled where buried)

- Af — ARTIFICIAL FILL
- Qls — LANDSLIDE DEBRIS
- Qal — ALLUVIUM: SILTY SANDS AND GRAVEL
- Qtn — NONMARINE TERRACE DEPOSITS: SILTY SAND, GRAVEL AND COBBLES

BEDROCK UNITS (Circled where buried)

- Tt — TOPANGA FORMATION
- Tvs — VEQUEROS SESPE FORMATION, PLEASANTS SANDSTONE MEMBER
- Tsa — SANTIAGO FORMATION

GEOLOGY SYMBOLS

- SURFACE BEDDING ATTITUDE: DASHED WHERE SUBSURFACE
- GENERALIZED BEDDING ATTITUDE: DASHED WHERE SUBSURFACE
- JOINT OR FRACTURE ATTITUDE: DASHED WHERE SUBSURFACE
- VERTICAL JOINT ATTITUDE: DASHED WHERE SUBSURFACE
- SHEAR ATTITUDE: DASHED WHERE SUBSURFACE
- FAULT ATTITUDE: DASHED WHERE SUBSURFACE
- CLAY BEDDING ATTITUDE: DASHED WHERE SUBSURFACE
- LANDSLIDE RUPTURE SURFACE ATTITUDE: DASHED WHERE SUBSURFACE
- HORIZONTAL BEDDING ATTITUDE

- ? — APPROXIMATE GEOLOGIC CONTACT: DOTTED WHERE BURIED, QUERIED WHERE INFERRED/UNCERTAIN
- ? — APPROXIMATE FAULT TRACE: DOTTED WHERE BURIED, QUERIED WHERE INFERRED/UNCERTAIN, WITH RELATIVE DIRECTION OF MOVEMENT D-DOWN, U-UP
- 600' — APPROXIMATE LOCATION OF CANYON SUBDRAIN/BACKDRAIN (5 CUBIC FT./FT. BURRITO TYPE WITH 6" OR 4" MINIMUM PERFORATED PIPE)
- APPROXIMATE LIMITS GRADING
- APPROXIMATE LIMITS OF FILL
- 20x5 — APPROXIMATE LOCATION OF KEYWAY WITH DIMENSIONS
- 600 — APPROXIMATE REMOVAL BOTTOM ELEVATION
- APPROXIMATE LOCATION OF LANDSLIDE WITH LANDSLIDE DESIGNATION, ARROW IN DIRECTION OF SUSPECTED MOVEMENT (DOTTED WHERE BURIED)
- 853+30 — APPROXIMATE LOCATION OF GEOLOGIC CROSS SECTION
- APPROXIMATE LOCATION OF SYNCLINE AXIS
- APPROXIMATE LOCATION OF ANTICLINE AXIS
- SEEPAGE

PLATE C

ETC SECTION 12 NORTH
AND ETC SECTION 13
LEGEND

REVISED BY	DATE REVISED
SC	12/98
JT	12/98

CALCULATED/DESIGNED BY — SC
CHECKED BY — JT

TCA PROJECT MANAGER — MICHAEL ENDRES

TOLL ROAD OVERSIGHT — AGNES VILLANUEVA

TRANSPORTATION CORRIDOR AGENCIES

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 12209 EA 012501

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

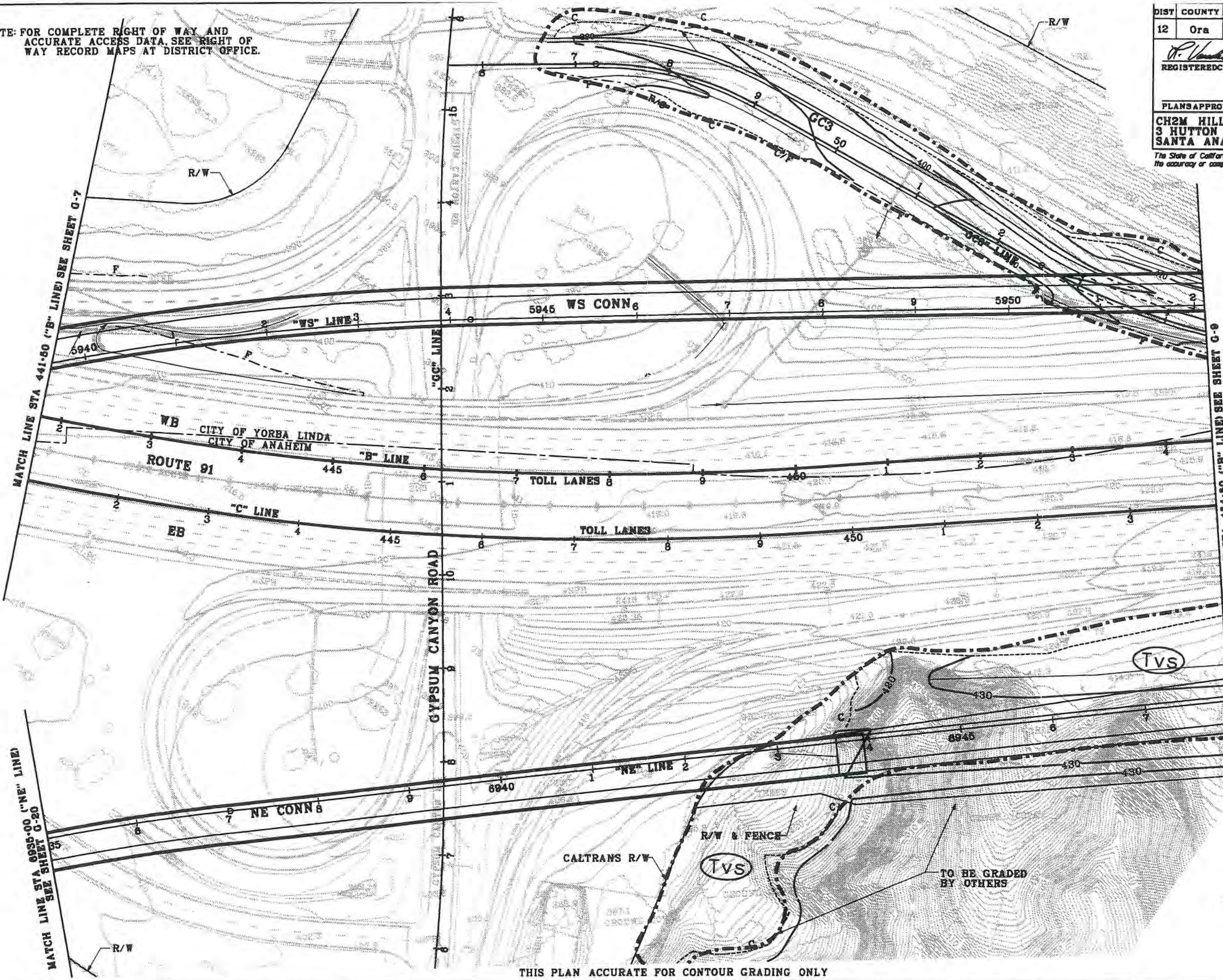
REGISTERED CIVIL ENGINEER

L. VANDERLINDEN
No. C46300
Exp. 12-31-98
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

NOTE: FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.



ETC SECTION 13
GEOTECHNICAL MAP
PLATE 13

SCALE: 1" -50'

G-8

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CALCULATED/ DESIGNED BY	ND	DATE 3/96	REVISED BY
CHECKED BY	MC	3/96	DATE REVISED

TCA PROJECT MANAGER
MIKE ENDRES

TRANSPORTATION CORRIDOR AGENCIES

13-NOV-1996 08:15:00 13g08.dlv

ZFA06E24,1 STANDARD.3CL GROSHT (REV. 1/93)

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU

EA 111000

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

REGISTERED CIVIL ENGINEER

L. VANDERLINDEN No. C46300 Exp. 12-31-98 CIVIL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

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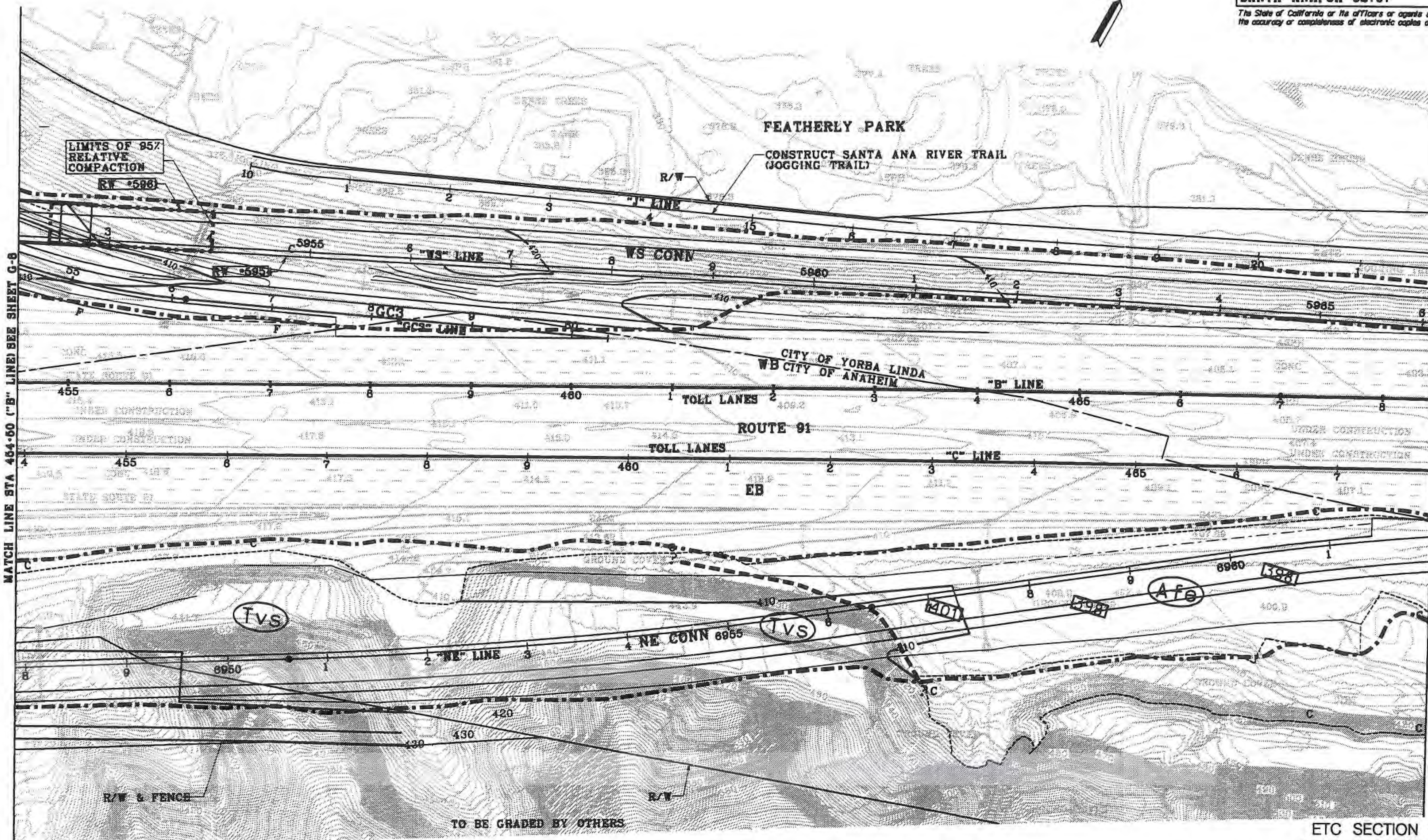

ETC SECTION 13
GEOTECHNICAL MAP
PLATE 14
SCALE: 1" = 50'

G-9

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TCA PROJECT MANAGER	CALCULATED/ DESIGNED BY	CHECKED BY	ND	MC	DATE	DATE REVISED	REVISED BY
MIKE ENDRES					3/96	3/96	

TRANSPORTATION CORRIDOR AGENCIES

08-OCT-1997 09:57:00 13g09.dlv

CU

EA 111000

ZF A0(24,1) STANDARD.2CL ORIGINT (REV. 1/90)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER L. VANDERLINDE No. C46300 Exp. 12-31-98 CIVIL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR.,#200
SANTA ANA, CA 92707

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CHECKED BY	MC	5/96	DATE REVISED

TCA PROJECT MANAGER
MIKE ENDRES

TRANSPORTATION CORRIDOR AGENCIES

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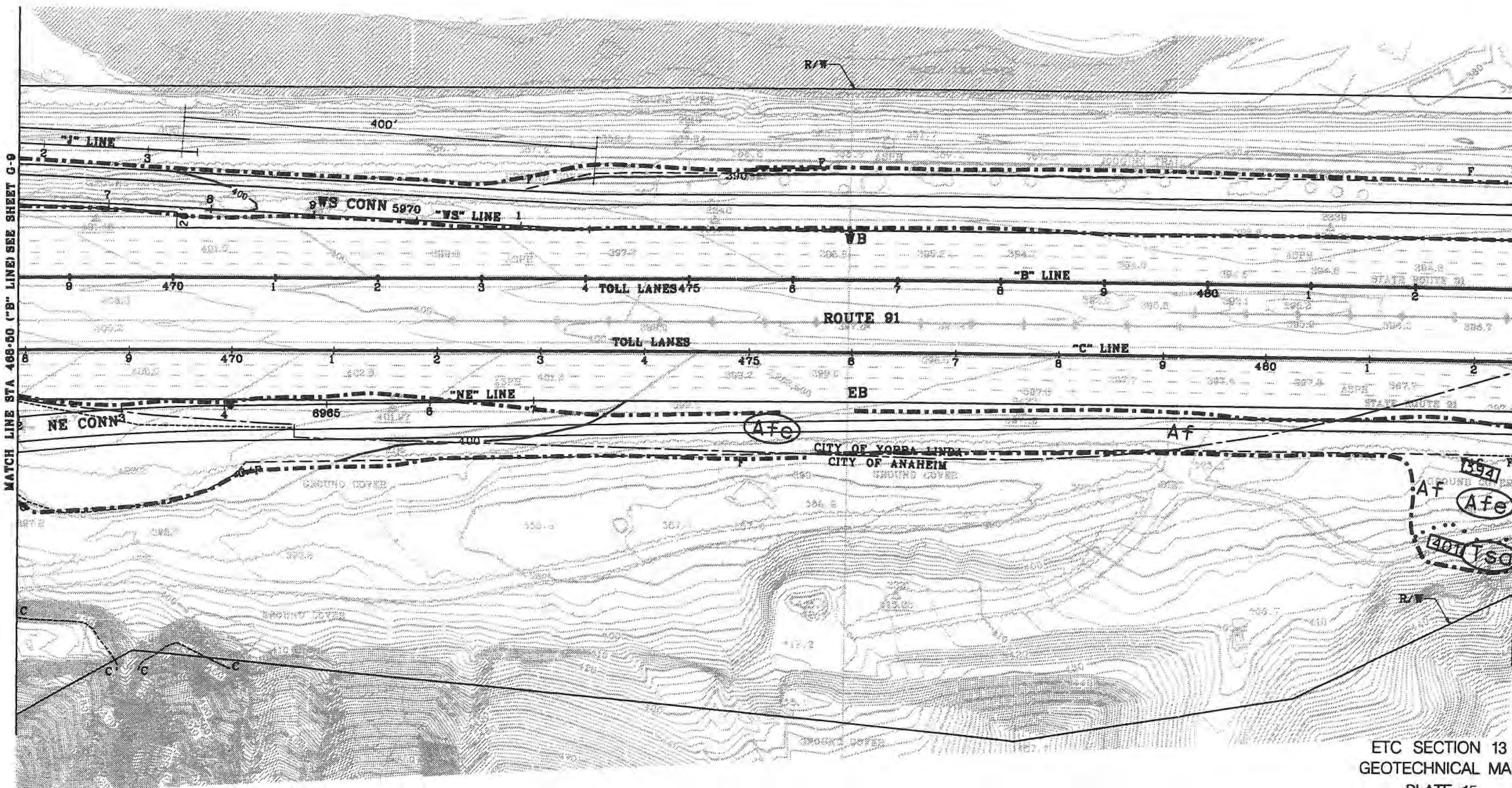

ETC SECTION 13
GEOTECHNICAL MAP
PLATE 15

SCALE: 1" =50' G-10

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CU | EA 111000

ZFAO424.13 STANDARD.2CL GRDSHT (REV. 1/93)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

REGISTERED CIVIL ENGINEER

PROFESSIONAL ENGINEER REGISTERED L. VANDERLINDEN No. C46300 Exp. 12-31-98 CIVIL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR.,#200
SANTA ANA, CA 92707

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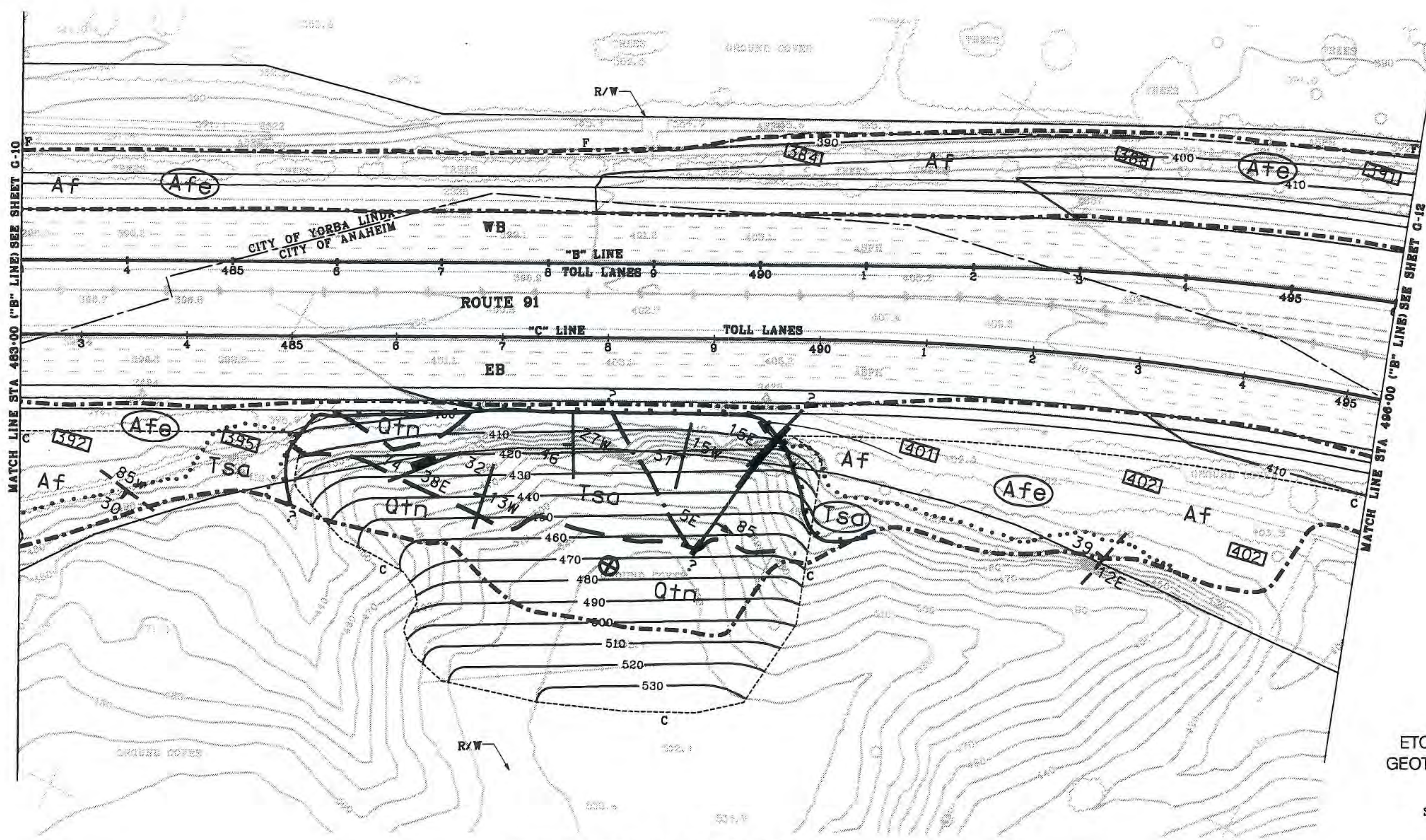
MIKE ENDRES	CHECKED BY	MC	5/96	DATE REVISED



THIS PLAN ACCURATE FOR CONTOUR GRADING ONLY

ETC SECTION 13
GEOTECHNICAL MAP
PLATE 16
SCALE: 1" = 50'

G-11

TRANSPORTATION CORRIDOR AGENCIES

17-OCT-1996 10:34:48 13g11.dlv

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CU

EA 111000

ZFADC(24,1) STANDARD.2CL GRDSHT (REV. 1/90)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96
REGISTERED CIVIL ENGINEER

PROFESSIONAL ENGINEER
L. VANDERLINDE
No. C46300
Exp. 12-31-98
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

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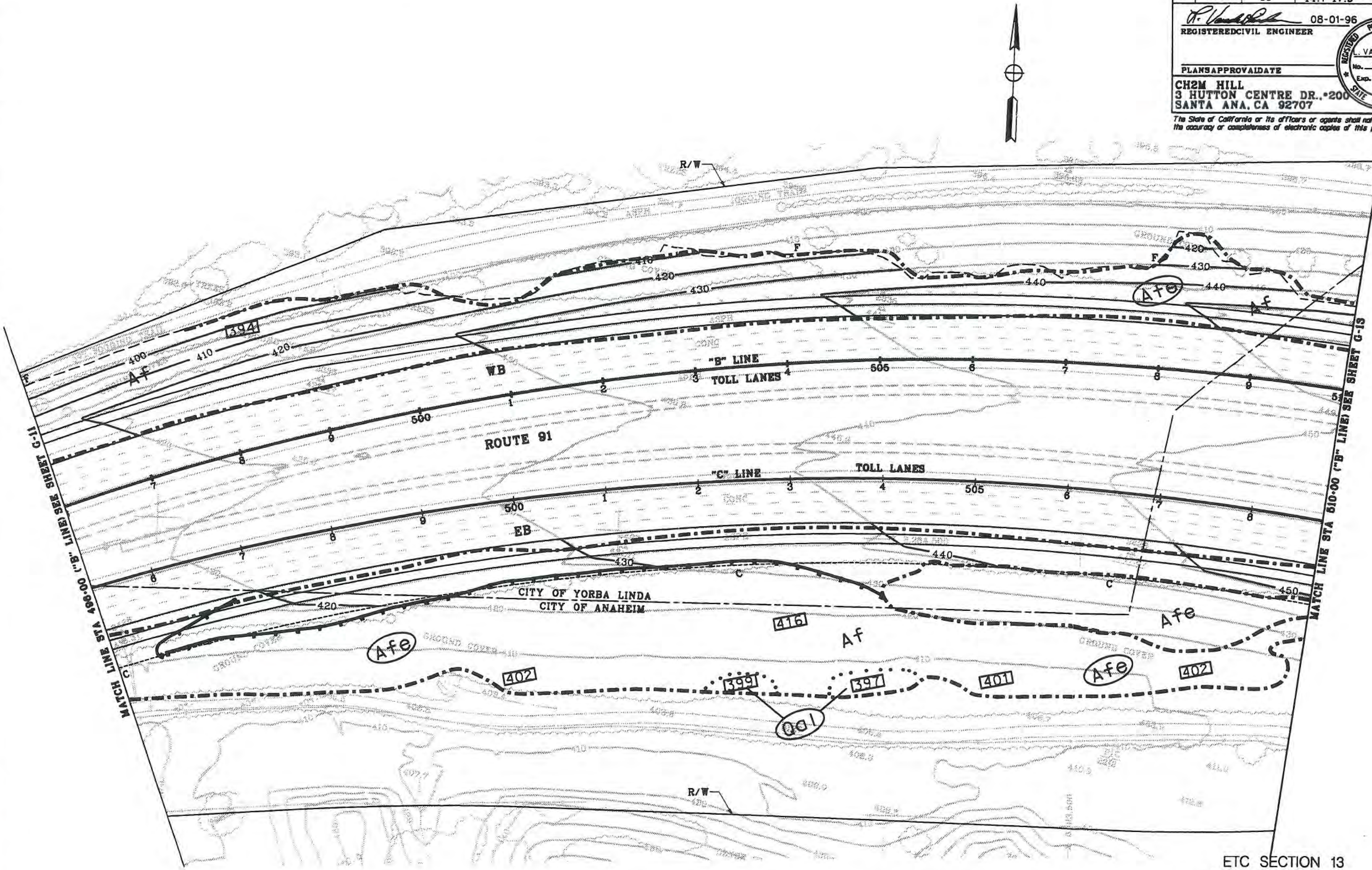
CHECKED BY	MC	5/96	DATE REVISED

TCA PROJECT MANAGER
MIKE ENDRES



ETC SECTION 13
GEOTECHNICAL MAP
PLATE 17
SCALE: 1" = 50'

G-12

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FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU

EA 111000

TRANSPORTATION CORRIDOR AGENCIES

17-OCT-1996 10:37:15 13g12.dlv

ZFA0424.13 STANDARD.2CL GRDSHT (REV. 1/90)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96
REGISTERED CIVIL ENGINEER

L. VANDERLINDEN No. C46300 Exp. 12-31-98 CIVIL STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

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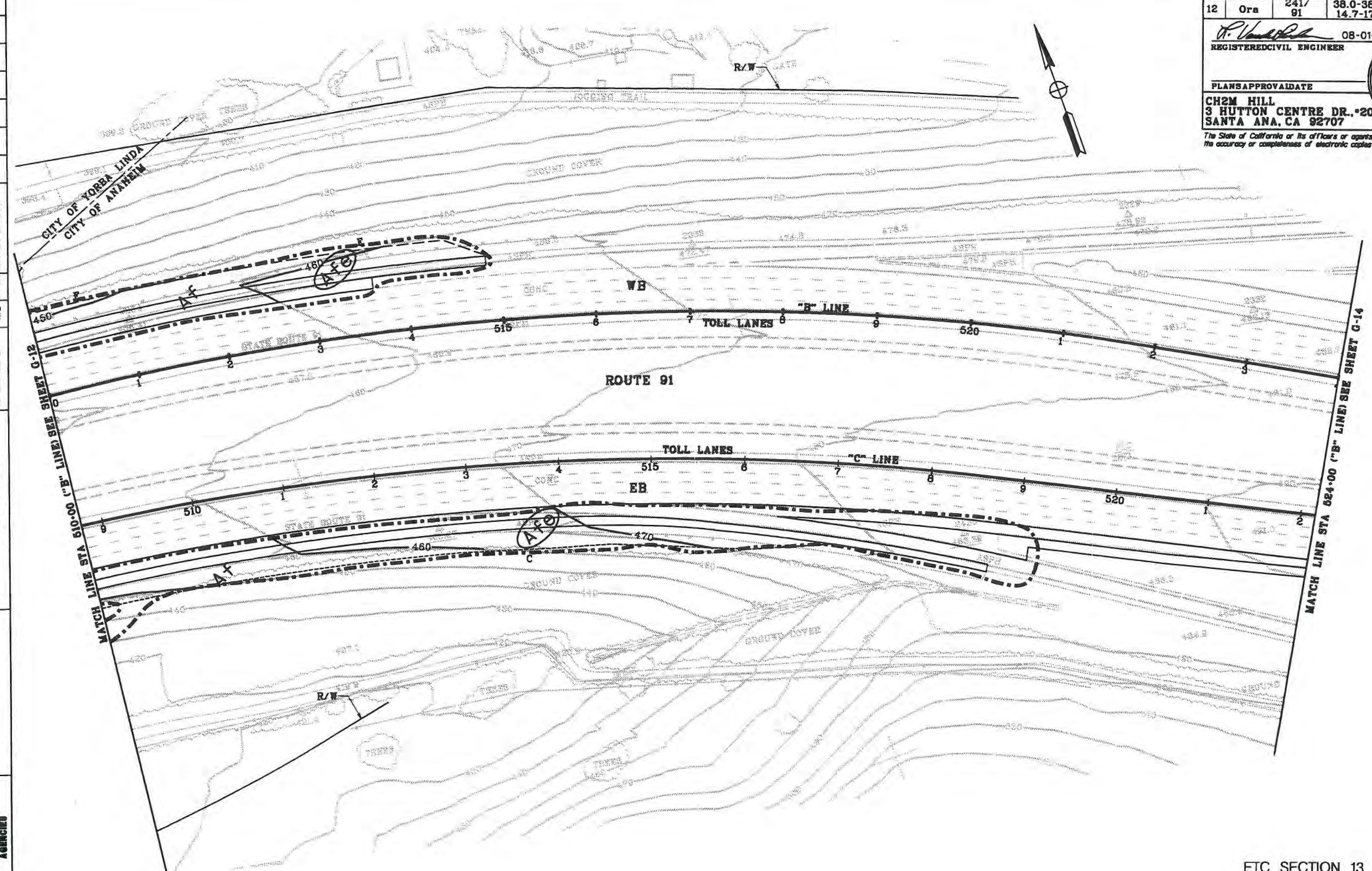
TCA PROJECT MANAGER	CALCULATED/ DESIGNED BY	CHECKED BY	DATE REVISED	REVISED BY
MIKE ENDRES	ND 3/96	MC 5/96		

TRANSPORTATION CORRIDOR AGENCIES

17-OCT-1996 10:40:38 13g13.dlv



ETC SECTION 13
GEOTECHNICAL MAP
PLATE 18
SCALE: 1" = 50'

G-13

THIS PLAN ACCURATE FOR CONTOUR GRADING ONLY

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU

EA 111000

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
L. VANDERLINDEN
No. C46300
Exp. 12-31-98
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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SANTA ANA, CA 92707

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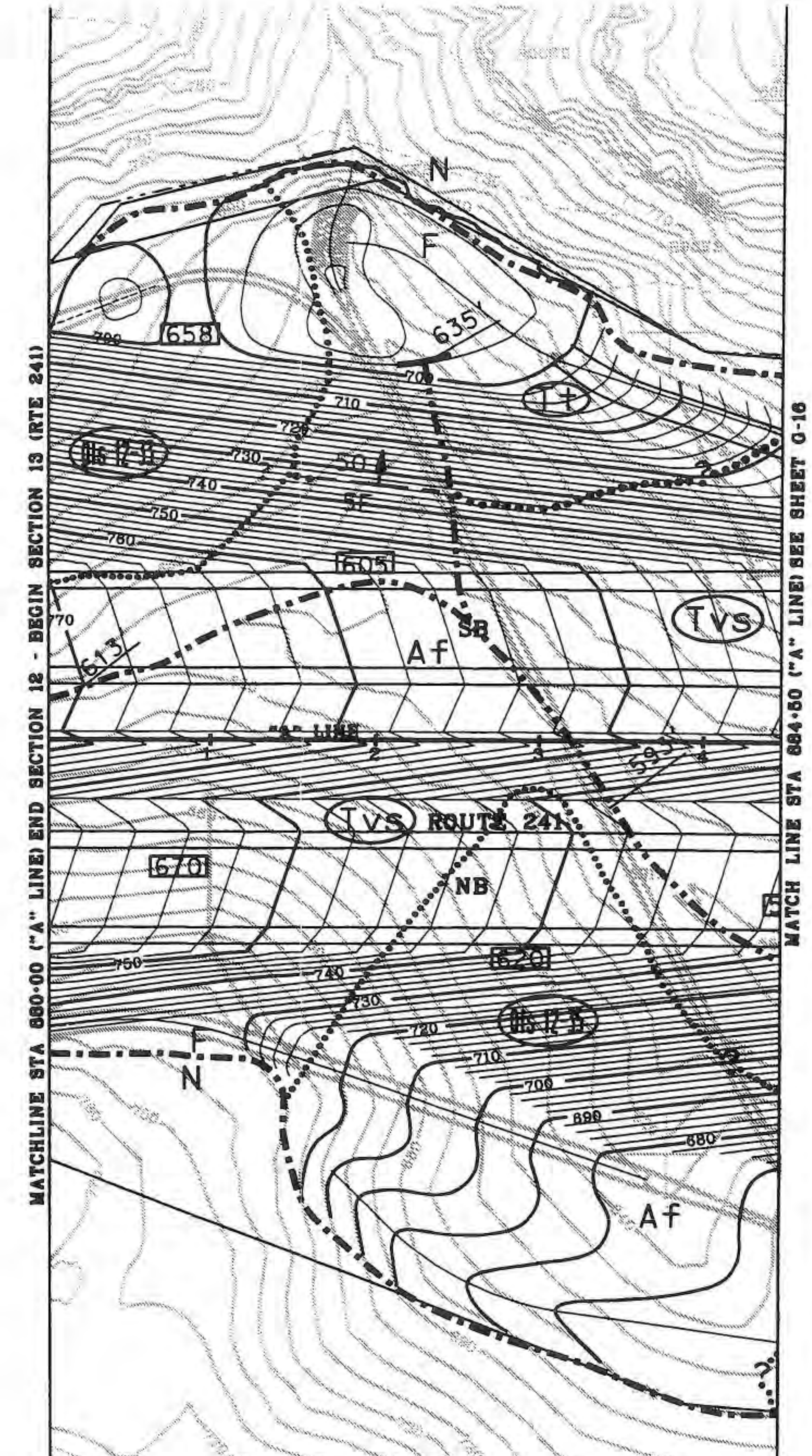

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TCA PROJECT MANAGER	CALCULATED/ DESIGNED BY	ND	CHECKED BY	MC
MIKE ENDRES	DATE REVISED	3/96		5/96
	REVISED BY			

TRANSPORTATION CORRIDOR AGENCIES

08-NOV-1996 12:00:20 13g15.dlv

ETC SECTION 13 GEOTECHNICAL MAP
PLATE 20

SCALE: 1" =50'

G-15

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

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EA 111000

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96
REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
L. VANDERLINDE
No. C46300
Exp. 12-31-98
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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3 HUTTON CENTRE DR., 200
SANTA ANA, CA 92707

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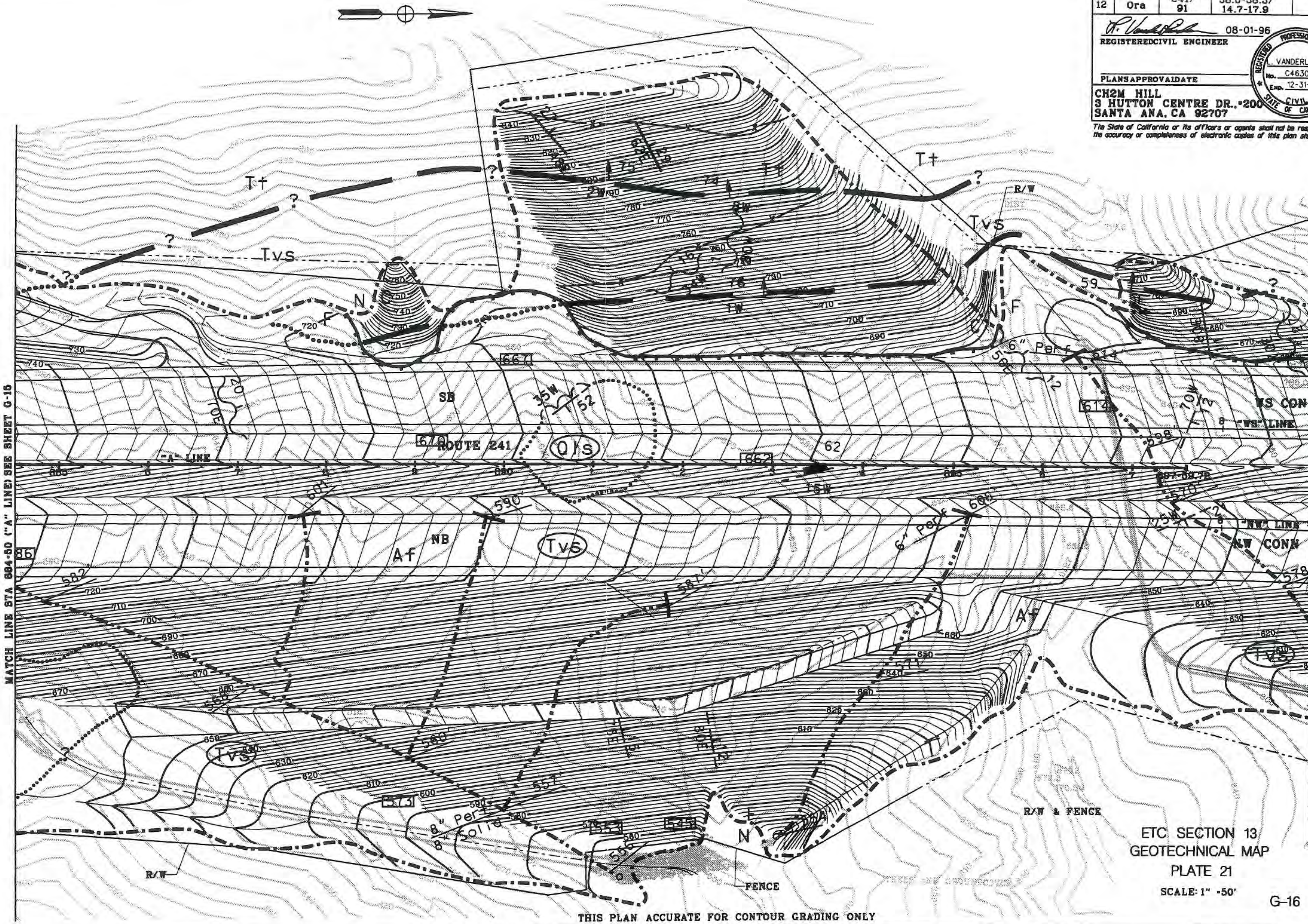

ETC SECTION 13
GEOTECHNICAL MAP
PLATE 21
SCALE: 1" =50'

G-16

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MIKE ENDRES	CHECKED BY	MC	5/96	DATE REVISED

TRANSPORTATION CORRIDOR AGENCIES

20-NOV-1996 09:59:31 13g16.dlv

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
L. VANDERLINDEN
No. C46300
Exp. 12-31-98
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

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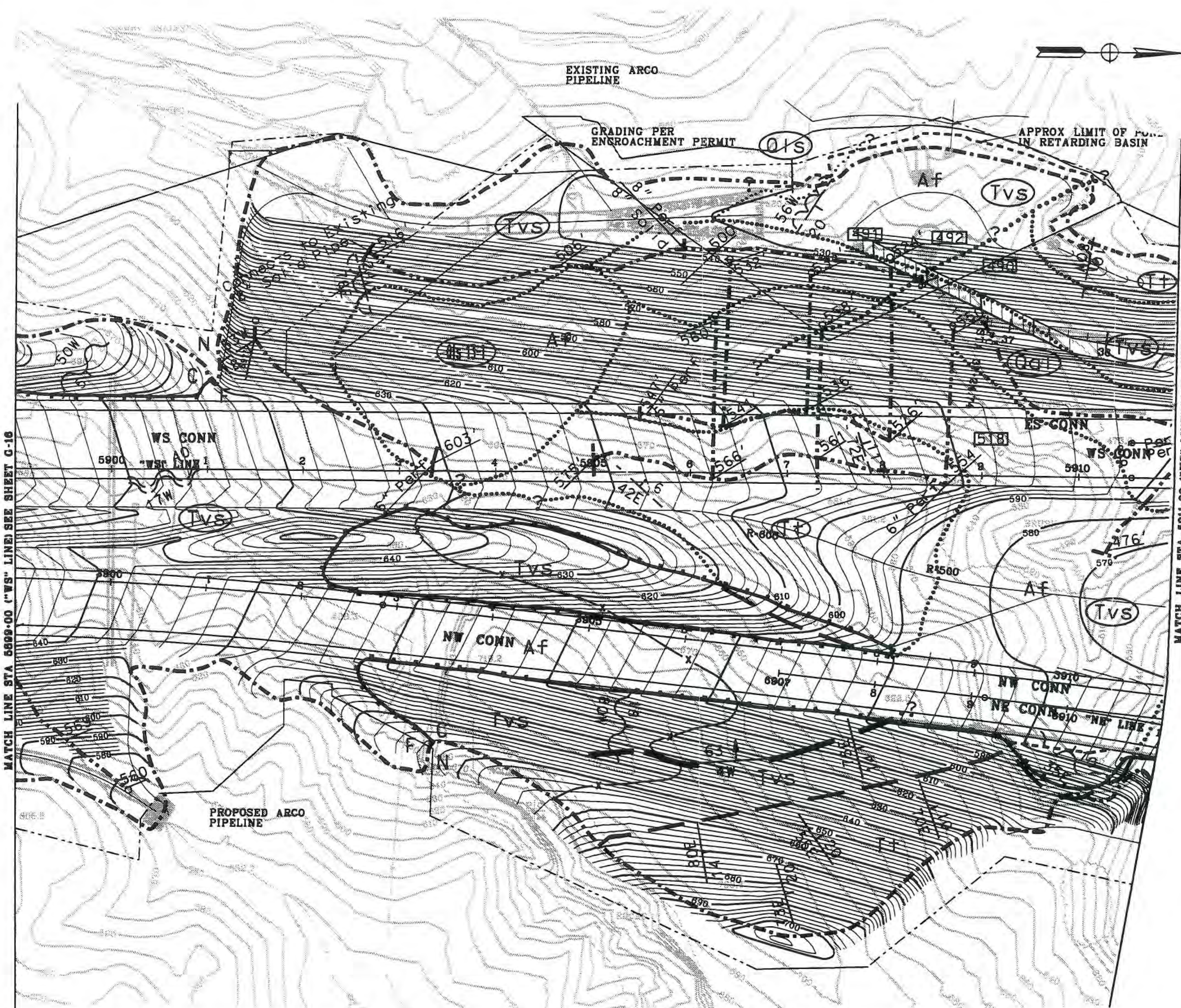

ETC SECTION 13
GEOTECHNICAL MAP
PLATE 22
SCALE: 1" -50'

G-17

TCA PROJECT MANAGER	CALCULATED/ DESIGNED BY	DATE	REVISED BY
MIKE ENDRES	ND	3/96	
	CHECKED BY MC	5/96	DATE REVISED

TRANSPORTATION CORRIDOR AGENCIES

12-NOV-1996 13:48:05 13g17.dlv

2FAOE24,13 STANDARD.2CL GROSNT (REV. 1/93)

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CU

EA 111000

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER L. VANDERLINDE No. C46300 Exp. 12-31-98 CIVIL STATE OF CALIFORNIA

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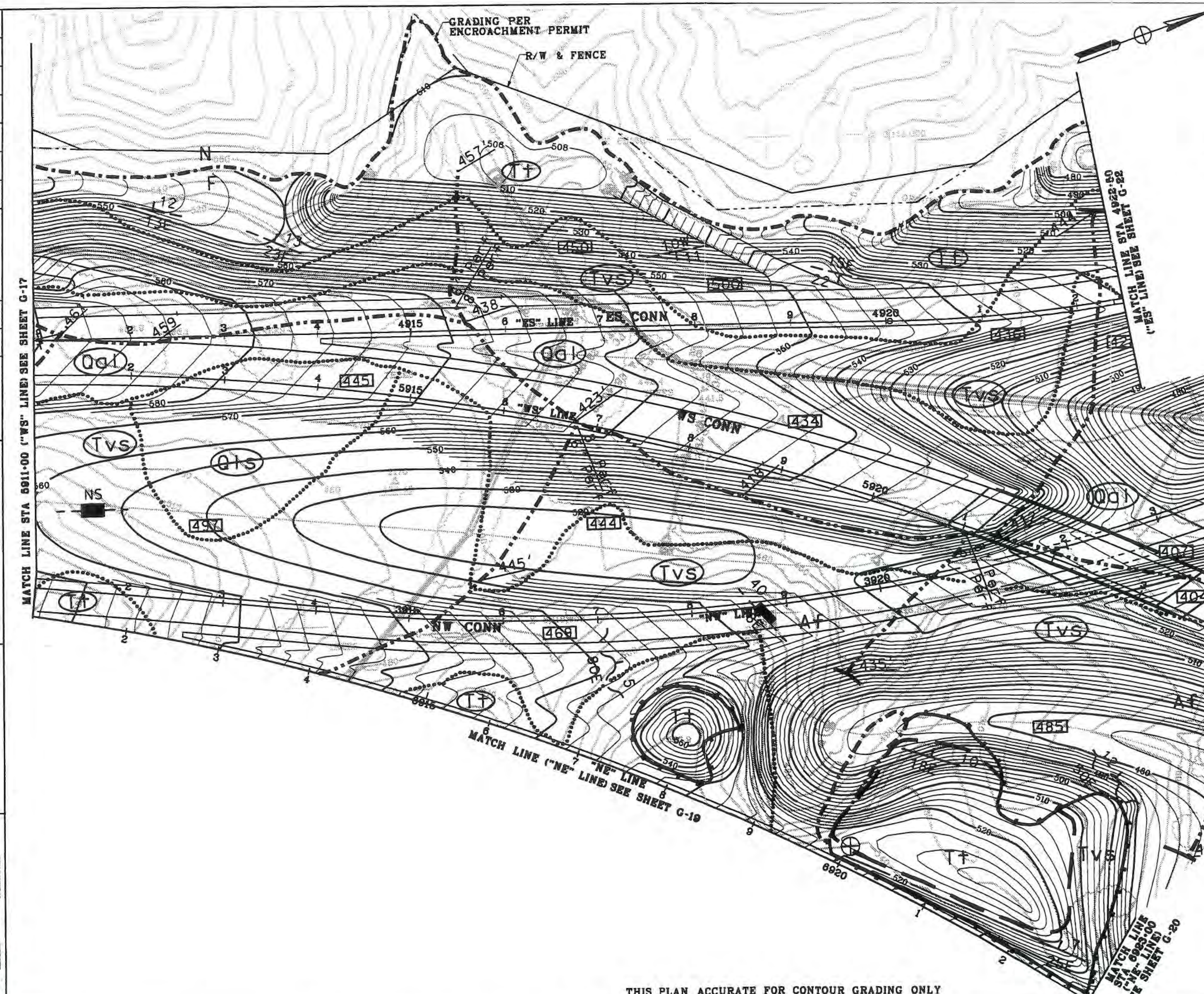

THIS PLAN ACCURATE FOR CONTOUR GRADING ONLY

ETC SECTION 13
GEOTECHNICAL MAP
PLATE 23
SCALE: 1" -50'

G-18

TCA PROJECT MANAGER	CALCULATED/ DESIGNED BY	ND	DATE 3/96	REVISED BY
MIKE ENDRES	CHECKED BY	MC	5/96	DATE REVISED

TRANSPORTATION CORRIDOR AGENCIES

12-NOV-1998 15:44:23 13g18.dlv

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU

EA 111000

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	241/ 91	38.0-38.3/ 14.7-17.9		

08-01-96

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
L. VANDERLINDE
No. C46300
Exp. 12-31-98
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

CH2M HILL
3 HUTTON CENTRE DR., #200
SANTA ANA, CA 92707

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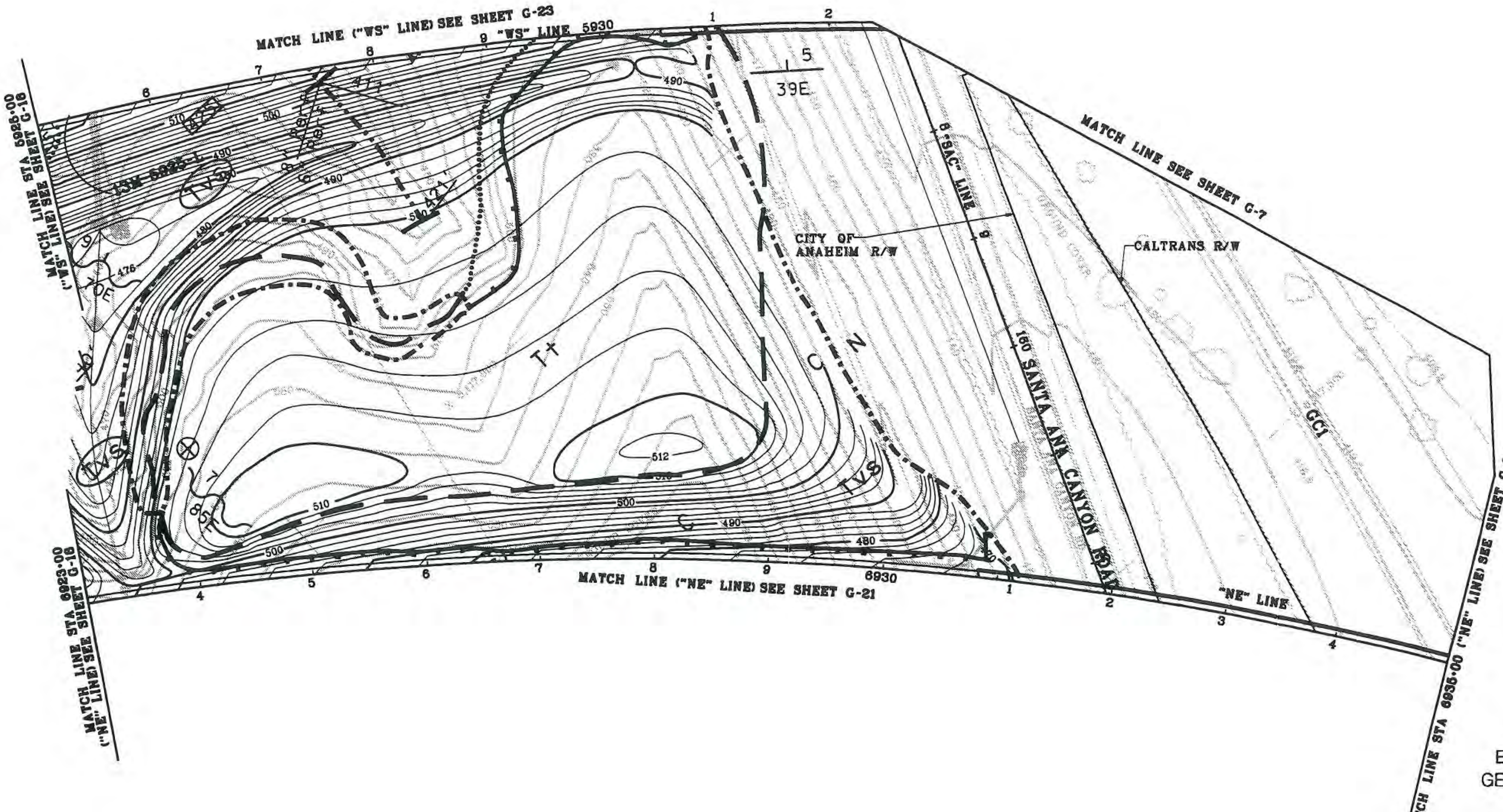
TCA PROJECT MANAGER	CALCULATED/ DESIGNED BY		DATE	REVISED BY	DATE REVISED
MIKE ENDRES	CHECKED BY	ND	3/96		
		MC	5/96		

TRANSPORTATION CORRIDOR AGENCIES

04-NOV-1996 13:56:01 13g20.dlv



ETC SECTION 13 GEOTECHNICAL MAP

PLATE 25

SCALE: 1" = 50'

G-20

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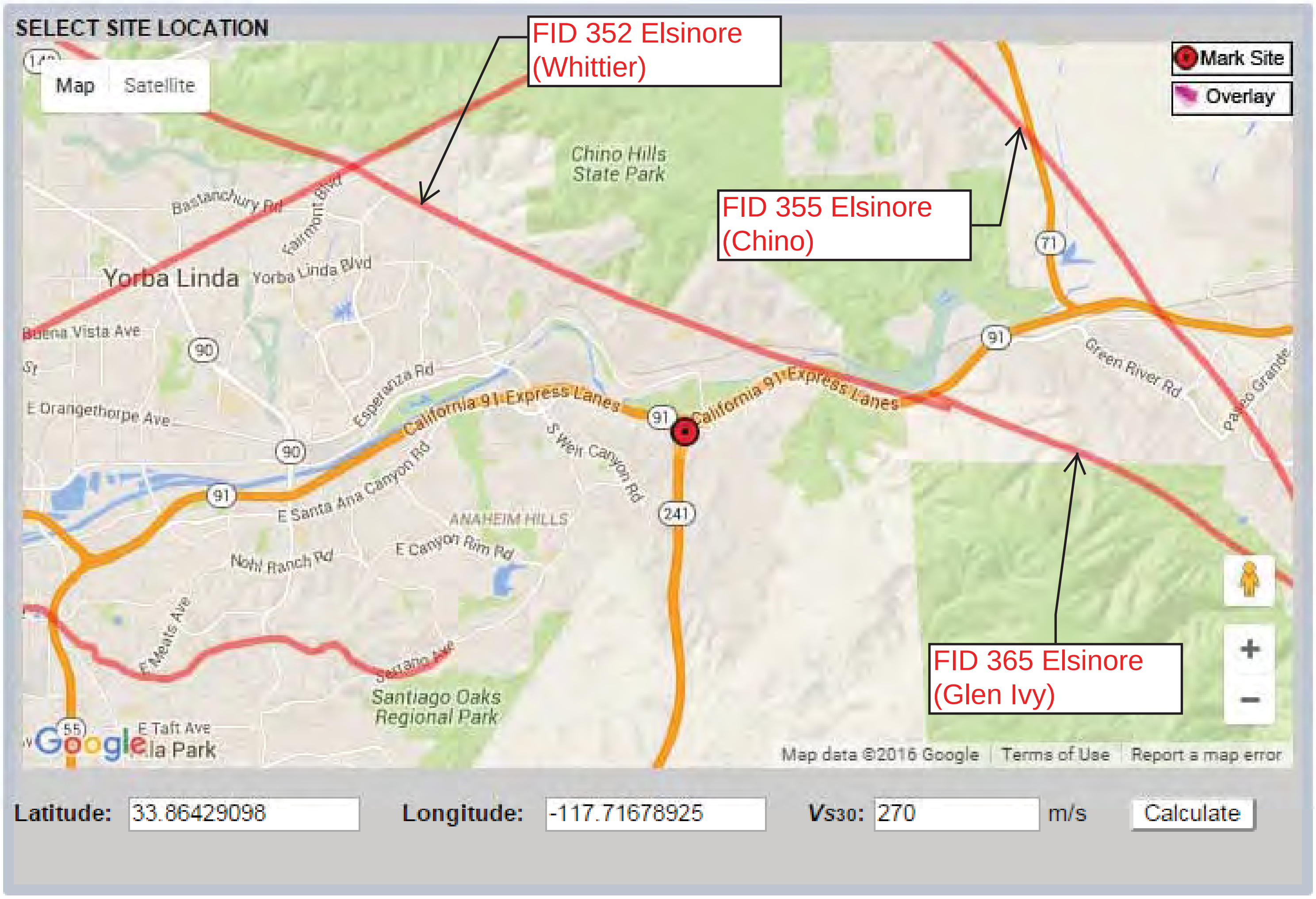
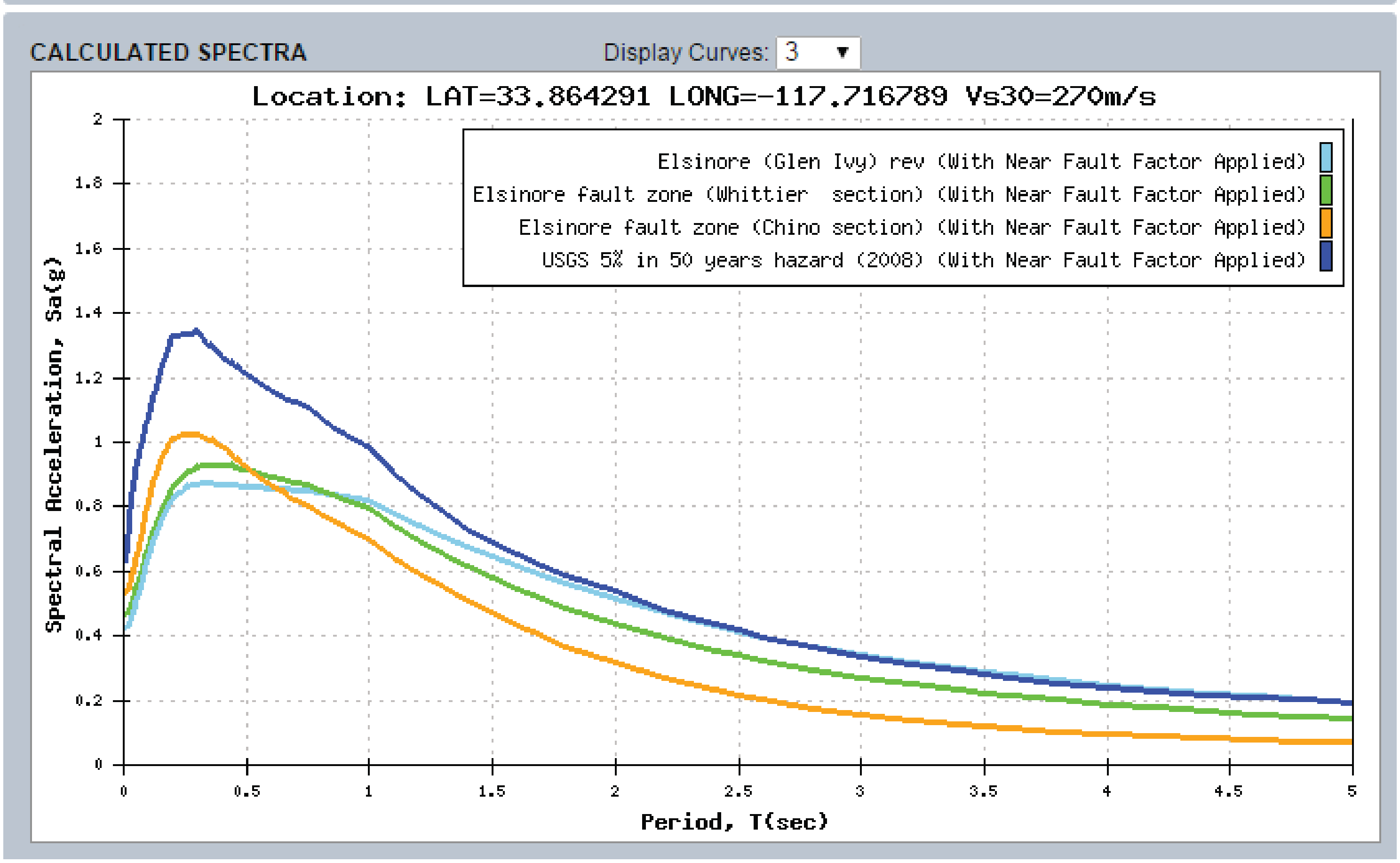
EA 111000

Appendix D
Caltrans Acceleration Response Spectra


SELECT SITE LOCATION
FID 352 Elsinore (Whittier)
FID 355 Elsinore (Chino)
FID 365 Elsinore (Glen Ivy)
Map
Satellite
Mark Site
Overlay
Chino Hills State Park
Yorba Linda
Bastanchury Rd
Fairmont Blvd
Yorba Linda Blvd
Buena Vista Ave
E Orangethorpe Ave
Esperanza Rd
California 91 Express Lanes
S Weir Canyon Rd
Green River Rd
Paseo Grande
E Santa Ana Canyon Rd
ANAHEIM HILLS
E Canyon Rim Rd
Nohl Ranch Rd
E Meats Ave
Serrano Ave
Santiago Oaks Regional Park
E Taft Ave
Map data ©2016 Google
Terms of Use
Report a map error
Latitude: 33.86429098
Longitude: -117.71678925
Vs30: 270 m/s
Calculate


CALCULATED SPECTRA
Display Curves: 3
Location: LAT=33.864291 LONG=-117.716789 Vs30=270m/s
Elsinore (Glen Ivy) rev (With Near Fault Factor Applied)
Elsinore fault zone (Whittier section) (With Near Fault Factor Applied)
Elsinore fault zone (Chino section) (With Near Fault Factor Applied)
USGS 5% in 50 years hazard (2008) (With Near Fault Factor Applied)
Spectral Acceleration, Sa(g)
Period, T(sec)

SITE DATA (ARS Online Version 2.3.06)

Shear Wave Velocity, *Vs30*:	270 m/s
Latitude:	33.864291
Longitude:	-117.716789
Depth to Vs = 1.0 km/s:	N/A
Depth to Vs = 2.5 km/s:	N/A

DETERMINISTIC

Elsinore (Glen Ivy) rev

Fault ID:	365
Maximum Magnitude (MMax):	7.7
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	13.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	4.46 km
Rjb:	4.46 km
Rx:	2.40 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.426	1.000	1.000	0.426
0.05	0.500	1.000	1.000	0.500
0.1	0.641	1.000	1.000	0.641
0.15	0.750	1.000	1.000	0.750
0.2	0.823	1.000	1.000	0.823
0.25	0.856	1.000	1.000	0.856
0.3	0.869	1.000	1.000	0.869
0.4	0.867	1.000	1.000	0.867
0.5	0.864	1.000	1.000	0.864
0.6	0.824	1.000	1.040	0.857
0.7	0.789	1.000	1.080	0.852
0.85	0.735	1.000	1.140	0.838
1	0.684	1.000	1.200	0.821
1.2	0.619	1.000	1.200	0.743
1.5	0.540	1.000	1.200	0.648
2	0.431	1.000	1.200	0.517
3	0.285	1.000	1.200	0.342
4	0.207	1.000	1.200	0.248
5	0.161	1.000	1.200	0.194

Elsinore fault zone (Whittier section)

Fault ID:	352
Maximum Magnitude (MMax):	6.9
Fault Type:	SS
Fault Dip:	75 Deg
Dip Direction:	ne
Bottom of Rupture Plane:	14.50 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	1.83 km
Rjb:	1.83 km
Rx:	1.83 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.466	1.000	1.000	0.466
0.05	0.543	1.000	1.000	0.543
0.1	0.671	1.000	1.000	0.671
0.15	0.776	1.000	1.000	0.776
0.2	0.857	1.000	1.000	0.857
0.25	0.901	1.000	1.000	0.901
0.3	0.920	1.000	1.000	0.920
0.4	0.931	1.000	1.000	0.931
0.5	0.915	1.000	1.000	0.915
0.6	0.859	1.000	1.040	0.893
0.7	0.810	1.000	1.080	0.875
0.85	0.734	1.000	1.140	0.836
1	0.663	1.000	1.200	0.796
1.2	0.580	1.000	1.200	0.696
1.5	0.485	1.000	1.200	0.581
2	0.365	1.000	1.200	0.438
3	0.226	1.000	1.200	0.272
4	0.157	1.000	1.200	0.188
5	0.118	1.000	1.200	0.142

Elsinore fault zone (Chino section)

Fault ID:	355
Maximum Magnitude (MMax):	6.6
Fault Type:	SS
Fault Dip:	50 Deg
Dip Direction:	SW
Bottom of Rupture Plane:	9.20 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	6.13 km
Rjb:	0.29 km
Rx:	8.01 km

Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.533	1.000	1.000	0.533
0.05	0.635	1.000	1.000	0.635
0.1	0.815	1.000	1.000	0.815
0.15	0.941	1.000	1.000	0.941
0.2	1.007	1.000	1.000	1.007
0.25	1.025	1.000	1.000	1.025
0.3	1.022	1.000	1.000	1.022
0.4	0.986	1.000	1.000	0.986
0.5	0.922	1.000	1.000	0.922
0.6	0.833	1.000	1.040	0.866
0.7	0.760	1.000	1.080	0.821
0.85	0.665	1.000	1.140	0.758
1	0.584	1.000	1.200	0.701
1.2	0.494	1.000	1.200	0.593
1.5	0.394	1.000	1.200	0.473
2	0.263	1.000	1.200	0.316
3	0.130	1.000	1.200	0.156
4	0.079	1.000	1.200	0.095
5	0.059	1.000	1.200	0.070

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.631	1.000	1.000	0.631
0.05	0.916	1.000	1.000	0.916
0.1	1.075	1.000	1.000	1.075
0.15	1.216	1.000	1.000	1.216
0.2	1.328	1.000	1.000	1.328
0.25	1.335	1.000	1.000	1.335
0.3	1.340	1.000	1.000	1.340
0.4	1.266	1.000	1.000	1.266
0.5	1.212	1.000	1.000	1.212
0.6	1.115	1.000	1.040	1.160
0.7	1.040	1.000	1.080	1.123
0.85	0.922	1.000	1.140	1.051
1	0.821	1.000	1.200	0.985
1.2	0.700	1.000	1.200	0.839
1.5	0.575	1.000	1.200	0.691

2	0.447	1.000	1.200	0.537
3	0.282	1.000	1.200	0.338
4	0.199	1.000	1.200	0.239
5	0.161	1.000	1.200	0.193

MINIMUM DETERMINISTIC SPECTRUM

Period	**SA**
0.01	0.226
0.05	0.275
0.1	0.400
0.15	0.481
0.2	0.505
0.25	0.499
0.3	0.486
0.4	0.446
0.5	0.400
0.6	0.350
0.7	0.311
0.85	0.265
1	0.230
1.2	0.192
1.5	0.152
2	0.107
3	0.064
4	0.043
5	0.032

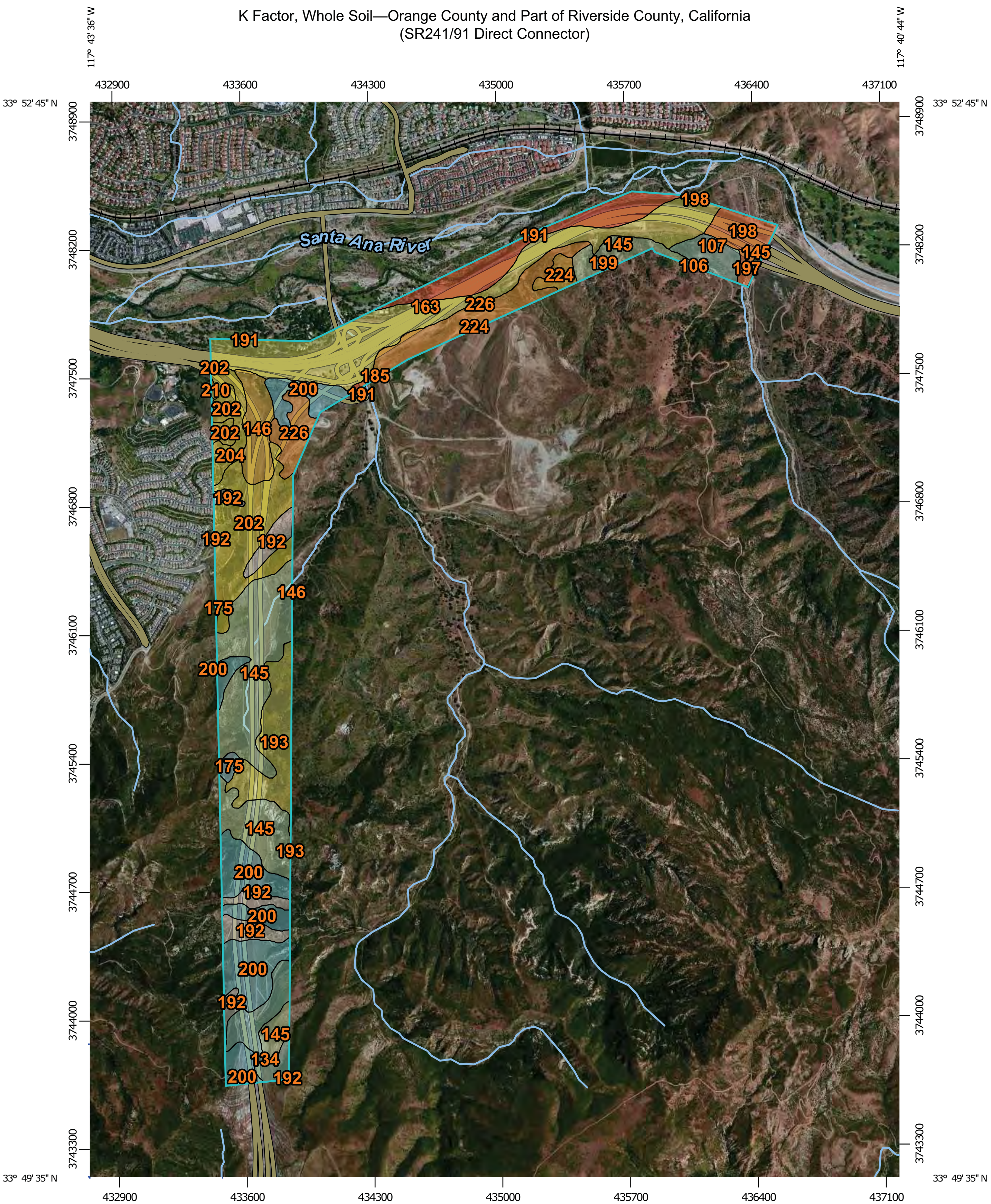
Envelope Data

Period	**SA**
0.01	0.631
0.05	0.916
0.1	1.075
0.15	1.216
0.2	1.328
0.25	1.335
0.3	1.340
0.4	1.266
0.5	1.212
0.6	1.160
0.7	1.123
0.85	1.051
1	0.985
1.2	0.839
1.5	0.691

2	0.537
3	0.342
4	0.248
5	0.194

Appendix E
Soil Survey Data

K Factor, Whole Soil—Orange County and Part of Riverside County, California
(SR241/91 Direct Connector)



Map Scale: 1:28,600 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 400, 800, 1600, 2400

Feet: 0, 1000, 2000, 4000, 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Lines

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Points

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 8, Sep 19, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 3, 2010—Jul 3, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

K Factor, Whole Soil

K Factor, Whole Soil— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
106	Anaheim loam, 15 to 30 percent slopes	.32	0.1	0.0%
107	Anaheim loam, 30 to 50 percent slopes	.32	14.0	2.2%
134	Calleguas clay loam, 50 to 75 percent slopes, eroded	.32	24.1	3.7%
145	Cieneba-Rock outcrop complex, 30 to 75 percent slopes	.28	121.0	18.7%
146	Corralitos loamy sand	.15	22.0	3.4%
163	Metz loamy sand	.20	112.4	17.3%
175	Myford sandy loam, 9 to 15 percent slopes	.37	3.5	0.5%
185	Pits		0.5	0.1%
191	Riverwash	.02	42.7	6.6%
192	Rock outcrop-Cieneba complex, 30 to 75 percent slopes		28.5	4.4%
193	San Andreas sandy loam, 15 to 30 percent slopes	.20	38.5	5.9%
197	Soboba gravelly loamy sand, 0 to 5 percent slopes	.05	3.4	0.5%
198	Soboba cobbly loamy sand, 0 to 15 percent slopes	.05	15.5	2.4%
199	Soper loam, 15 to 30 percent slopes	.37	1.5	0.2%
200	Soper loam, 30 to 50 percent slopes	.37	82.7	12.8%
202	Soper gravelly loam, 30 to 50 percent slopes	.17	63.1	9.7%
204	Soper-Rock outcrop complex, 30 to 75 percent slopes	.17	15.9	2.5%
210	Thapto-Histic Fluvaquents	.15	0.7	0.1%
224	Yorba cobbly sandy loam, 9 to 30 percent slopes	.15	6.9	1.1%

K Factor, Whole Soil— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
226	Yorba cobbly sandy loam, 30 to 50 percent slopes	.10	51.4	7.9%
Totals for Area of Interest			**648.3**	**100.0%**

Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)